

BRITISH
DAIRYING

Prof. J. P. SHELDON

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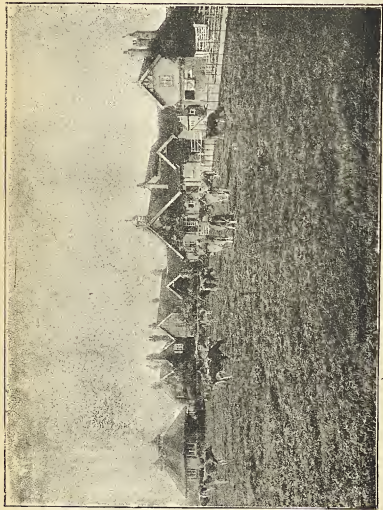


FIG. 1.—THE HOMESTEAD, COLLEGE FARM, FINCHLEY. (*From the Front.*)

BRITISH DAIRYING

*A HANDY VOLUME ON
THE WORK OF THE DAIRY FARM*

FOR THE USE OF
*TECHNICAL INSTRUCTION CLASSES, STUDENTS IN
AGRICULTURAL COLLEGES, AND
DAIRY FARMERS*

BY

PROF. J. P. SHELDON,

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FORMERLY PROFESSOR OF AGRICULTURE AT THE ROYAL AGRICULTURAL COLLEGE
AUTHOR OF "DAIRY FARMING," ETC.

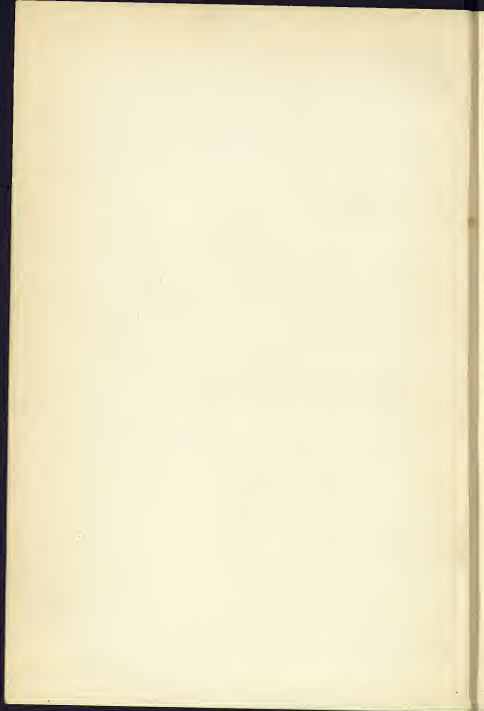
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Second Edition, Revised



LONDON
CROSBY LOCKWOOD AND SON
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1896



PREFACE.

It is now more than twenty years since I first took up the question of Dairying, considering it an industry of first-rate importance but far too much neglected, and seeking to infuse some little of new life into it; and my tongue and pen have been tolerably busy upon the subject ever since.

I have for some time had the satisfaction of seeing the greatly awakened interest which is taken therein now, as compared with a quarter of a century ago, and of knowing that a very substantial measure of progress in dairy reform has been attained. At the same time I am aware that much remains to be done before we have reached the degree of perfection which we may fairly hope to attain, and that the need of tuition will be perennial so long as dairying remains an industry of man.

The present volume is based upon a series of eight articles which were published in the summer of 1892, and which received so large a meed of favour as to justify the belief that they would be welcomed by the public in a form which is at once permanent and convenient.

Those articles, however, have now been altered, expanded, and to a great extent recast, with the view of adapting them for publication in book form. Seven new chapters have been written, and are added to the original and expanded eight, the whole of them aiming to form a useful book on Practical Dairying, suitable for the use of advanced pupils in the Schools, for students in the Agricultural Colleges, for those who avail themselves of the current system of technical instruction in dairy work, and for the rank and file of dairy farmers. The usefulness of the volume will be largely increased by the illustrations now added to the original matter. Several of the phototypes of prize stock have been taken by permission from Prof. Robert Wallace's well-known book, "The Farm Live Stock of Great Britain."

Twenty-five years ago there were but few writers and teachers in the domain of the dairy; now there are many, and the number is constantly being augmented. The literature of the dairy, indeed, is now quite extensive, and technical education is in full swing in the dairying counties. Many ladies of grace and education have taken up dairy tuition as a pursuit in life, and many others, now in training, are coming forward to emulate them in their beneficent work. All honour to them I say, and all success I hope, for they are doing what will be of permanent advantage to the country at large.

SHEEN, ASHBOURNE.

January 1, 1893.

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BRITISH DAIRYING.

CHAPTER I.

AN IDEAL DAIRY FARM.

A Model Farm.—Pasture and Meadow.—A Special Point.—An Accessory Farm.—Production of Milk.—A Pleasant Picture.—Sheds and Out-buildings.—Crops.—A Perfect Little Dairy.—The Live Stock.

FROM the point of view on which a practical dairy farmer takes his stand, any dairy farm comes within the limits of ideality if, during the period which stretches back to the beginning of the eighties, it has yielded a profit of 8 or 10 per cent. on the tenant's capital, and kept the family! This is understood to include the value of the services performed by the farmer and his wife and children. Indeed, an average profit of 5 per cent., after the accounts have been debited with all payments and depreciations, is one which, unfortunately, has of late years been far too much "honoured in the breach than the observance."

Ideal dairy farms, maintained for fancy, regardless of profit, and dairy farms, not ideal, which have yielded reasonable profits, are not quite so numerous now as they were a dozen or fifteen years ago. During the seventies, and for some years before them, there was inducement enough to combine the ideal with the practical in dairy farming; at all

events when the farmer happened to be his own landlord ; but for all that it was not too generally done.

Whenever we happen to drop on a period of handsome and sustained profits—the seventies were one of this sort—there soon sets in a tendency, in some quarters, in the direction of ideality in farming : the word may be taken to mean improved or model buildings, probably new ones, well-trimmed fences, new gates, good roads, bigger crops, better live stock, smarter equipments, and so on.

It is generally a good sign when such improvements are the rule rather than the exception, for the men who make them have money to spend and encouragement to spend it. From this point of view, therefore, reasonable ideality in farming is not a thing to be laughed down, for it is the substance of money made and the evidence of more that is expected.

A Model Farm.

In the month of October, 1891, I went to see the model dairy farm which is occupied by Mr. G. T. Barham, at Finchley, near London. It is an ideal dairy farm to all intents and purposes, and a practical one too, and therefore I cannot, perhaps, in a chapter like this, do better than describe it. The situation of the farm is just about perfect, and is therefore ideal ; indeed, no farm can be ideal unless it has an ideal situation. It is amongst the rolling loams of Middlesex, sloping to the south, well enough timbered to make it handsome and almost park-like ; it runs alongside a magnificent road, and is in sight of the suburbs of London ; the land, not naturally the most fertile to be found in England, is of that free and open kind which so willingly responds to liberal treatment. It was too late in the season to inspect its herbage botanically, for the pastures and aftermath had been eaten off tolerably bare. But the soil is of a nature to nourish a variety of the more nutritious grasses, and it does well in a “dropping season,” along with the genial warmth which characterises the southern counties.

The meadows yield very large crops, and are commonly

mown twice in the year ; but then they are frequently dressed with the rich manure produced by a herd of dairy cows that are most generously fed with cake and various sorts of corn all the year round, in addition to which some 400 tons of stable manure are brought each year from London, where Mr. Barham keeps 130 horses in connection with the great retail milk trade of the Express Dairy Company, of which he is the managing director. Mr. Barham believes in developing the utmost capacity of his land by frequent dressings of rich manure.

Pasture and Meadow.

The farm consists of 120 acres, 110 of which are in permanent pasture and meadow, and 10 in prolonged arable culture. The pastures are dressed whenever they need it with horse manure from town, and probably they are dressed at times when no one would say they really needed it. To dress pasture land with horse manure is excellent farming practice, particularly where cows eat the grass. Such manure as this from the London stables is as good as could be found of its kind, richly compounded of the fertilising elements—nitrogenous and phosphatic elements—which are so excellently suited to promote a rich, varied, sweet, and abundant herbage, amongst which white clover is conspicuous on suitable soils. But this is not all the benefit resulting from such dressings of manure. We know that mineral superphosphate will promote the growth and improve the quality of the herbage of old grass land, particularly on a strong, damp soil ; but it is purely a mineral manure, whereas that from the stables is a vegetable manure, which, containing the elements of hay as well as of corn, supplies the earth with the properties which cropping and grazing take out of it.

And, again, it is well known, too, that land manured with the solid excreta of horses produces a herbage that is peculiarly acceptable to cows, so that such land will graze off much cleaner and leveler than it would if dressed with excreta from the cow-sheds. Marked instances of this have come within

my own experience in times gone by, and, indeed, are coming still. Mr. Barham has ample faith in the dictum that if you feed the land the land will feed the cattle; and he carries it out to the utmost, or nearly the utmost expedient limit.

A Special Point.

The number of cows in milk on the farm averages about 40 all the year round; there are also four Shire horses, two of them mares in foal, several roadsters for running the milk vans, and a very breedy mare with a foal at her heels. About the live stock I shall have more to say presently. Well, for these animals there are 30 to 40 acres of pasture, while the meadows cover 70 to 80 acres; that is, in a grassy season, 30 acres of pasture will suffice, leaving 80 for mowing. As I have said before, the meadows cut very heavy crops, as meadows will if they be dressed every winter with manure from cake and corn.

Mr. Barham evidently believes in having a large accumulation of hay on the premises in times when other people's hay is cheap in the market; but he takes care that the accumulation is all of his own growing, for the hay grown on well-farmed land is above average hay in nutritive value. I do not remember ever seeing before, on a farm of 120 acres, such a wealth of big hayricks, of 40 to 50 tons each,—six or seven of them. When meadows are manured as these are at Finchley, and when the cows constantly eat cake, corn, brewers' grains, and, in winter, roots, it is quite feasible to accumulate a large stock of hay against the inevitable time of scarcity; and half a dozen big ricks of good hay, framed by the oak fence of a rickyard, form a picture which any dairy farmer may regard with satisfaction. They are like having a good balance at one's bank.

Mr. Barham does not concern himself much about silage; he looks upon it as not the right sort of thing to produce milk from, and not a pleasant thing to use. Brewers' grains and roots, supplemented by corn and cake, suit his purpose better; and he is in no fear of tainted milk, as he would be if silage were given to the cows.

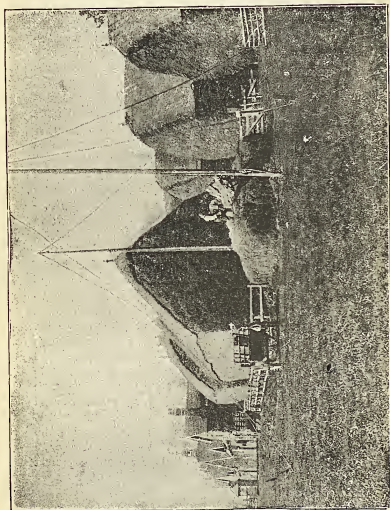


FIG. 2.—THE STACKYARD, COLLEGE FARM.

An Accessory Farm.

Besides the College Farm, Mr. Barham has an outlying farm, down at Wadhurst, in Sussex, where he keeps his surplus cattle—the cows that are dry for calving, the young ones for replenishing the herd, and so on; a sort of preparatory school to the College Farm, a nursery in which the young bovines are trained for the practical work they have to do later on. He has also a sort of supplementary milk-producing farm at Hampstead—a semi-model farm—on which 30 to 40 cows in milk are kept. In order to keep up a constant supply of milk for the suburban homes of the locality, it is, of course, necessary to have cows calving pretty well all the year round, particularly in the autumn and winter. But a constant supply is not all that is aimed at—constant, I mean, in respect of quantity; for a constant quality is also wanted, and a succession of newly-calved cows gives to the milk that freshness and tone, so to speak, which are required by the somewhat fastidious householder of to-day.

The question of uniformity in quality and character of the milk is a matter of quite as much importance to a fashionable milk trade in suburban London as it is to the provision dealer who supplies the West End families with butter, and I shall have more to say about it in a subsequent chapter. Surrounded by an increasing population, in a favourite suburb of London, the College Farm has a ready retail trade for all its milk, at fourpence a quart. This, indeed, is a primary feature in an ideal dairy farm, which at the same time is a profitable one. Personally, I should be inclined to refuse the term ideal to a dairy farm that did not yield a profit. But this, of course, is a matter of opinion, for there are idealists in farming who do not much care to make a profit. Years ago there were a good many of them; more than there are at the present time.

Production of Milk.

In the year 1890 the milk produced on the College Farm amounted to 28,184 gallons. Half of the cows were Guernseys

and the rest Shorthorns and Kerrys, one-fourth of the number being heifers and one-fifth four-year-olds. This yield of milk is an average of more than 700 gallons per cow; but as newly-calved cows are brought into the herd at times to replace such as are going dry for calving, the average yield is reduced to about 587 gallons per individual cow, if we reckon that she is in milk ten months out of the twelve. On this reckoning, however, the money value of each cow's milk at fourpence a quart comes to close on £37 for the ten months. It will be admitted, I think, that these figures supply a pretty considerable element of ideality to the College Farm at Finchley. The milk of each and every cow is weighed as soon as she has given it, the pail being hung on a spring balance which is there for the purpose. The weight of the milk is then entered on a sheet against the name of each cow from which it is taken, and the weekly totals are duly entered in a ledger in the office.

In this way the value of each cow as a milker can be seen at a glance, and it is a practice which may be recommended to every dairy-farmer in the land. It is only in this way, indeed—supplemented by test or analysis, if the quality of the milk is to be known—that the cows which are not worth keeping or breeding from are found out; and such cows are, of course, disposed of without much delay. Similarly, if a cow happens to be unwell, the fact is detected at once by the sudden drop in her yield of milk, and her ailment can be attended to before it has gone very far.

A Pleasant Picture.

The buildings at the College Farm were planned by Mr. Barham, and erected a few years ago. They are well arranged for convenience, well lighted and ventilated; and while utility is seen in every inch of them, they are at the same time ornamental without being very costly. The main building is spacious, lofty, and well aired.

First, you pass through a sort of entrance-hall, on one side of which is the laboratory, where all needful medicines and restoratives are kept; and on the other is the office, in

which all the book-keeping is done; and above are men-servants' dormitories. This entrance-hall is roomy and useful for various purposes; it is enclosed by a screen containing large panes of glass, through which the interior of the main building is seen to advantage. Up the centre of this main building is laid a tasteful but inexpensive aisle of Minton's tiles, which look clean and pleasant. On either side of this roomy aisle is a long row of intelligent and cheerful faces of the cows that give the milk; not quite all of them are there, however, for the Kerrys are too little for the stalls; but the placid and gentle Guernseys and the massive and composed Shorthorns regard you, as you pass along between the rows, with eyes that seem to contain notes of interrogation. The stalls and mangers are all of pleasing design, and each cow's name is up behind her on the wall, which is garlanded with many cards that denote prizes won at the shows. The stalls are littered with small chips or shavings of wood obtained from some workshop in town, and, while answering the purpose very well, they look clean, crisp, and pleasing. The chips act as absorbents of liquid excreta, and go out on the meadows in manure.

Sheds and Outbuildings.

At the far end of the main building we come to the rooms, and sheds, and spaces where chaffing of forage, pulping of roots, and mixing of food are carried on. The chaffcutter, root-pulper, and cake-crusher are driven by a handy steam-engine near to. These offices were designed to make the work as easy and pleasant as could then be arranged; it is, however, possible that the few years' experience already enjoyed might suggest certain little improvements here and there, and Mr. Barham thinks there may be something else wanted before finality of convenience has been attained. A man who takes a warm interest in his farm buildings is commonly trying to discover some place or other where an improvement could be made.

Linseed-cake is a good deal used, or rough cotton-cake whenever grass or roots are too relaxing to the cows' bowels;

the husk of cotton-cake is understood to possess an astringent property, and may be used with advantage on farms where cattle "scour." At other times, pea-meal, oatmeal, bran, and "biscuit middlings," at the rate of 4 lbs. or 5 lbs. per cow per day, are mixed with grains, and half a bushel of this mixture is given to each cow twice a day. Besides this, they have in winter half a bushel each of roots per day, and a truss of hay is divided among eight of them. Cows that yield a large quantity of milk have their corn specially allotted, and so have those that are barren and are being fattened for the butcher during the fag-end of the milking period. When a barren cow begins to fall off in milk she has extra corn, and the result is that her milk improves somewhat in quality, whilst she takes on flesh for the butcher.

In a subsequent chapter I shall probably have something to say about the effect of improved food on the quantity and quality of milk. (See pages 59 and 60.)

Crops.

Of the ten acres of arable land (which is friable loam, inclined to burn in a hot summer) six are generally planted with yellow globe, golden tankard, and long red varieties of mangels. A variety of this particular root is grown, because some seasons suit one kind, while other seasons suit another, and there is no chance of telling beforehand what any season is to be. In 1890 and 1891 the yellow globe made the best crop, but in other years the long red have averaged 45 tons per acre, when the yellow globe have averaged but 40½ tons. As soon as the mangels are all lifted and the tops consumed, the land is cleaned and ridged up for the winter, and the ridges are heavily manured in March from the cow-sheds; 1½ cwt. of nitrate of soda per acre is sown before the ridges are split to cover the manure.

No fertiliser is bought save nitrate of soda, though it is likely that mineral superphosphate would be found very useful. An acre is sown with kohl rabi seed, and this supplies plants to fill up gaps among the mangels, and for the head-

lands. The mangel tops and kohl rabi, with whatever cabbages may have been planted, supply the cows with green food till after Christmas, the rabi being always considered a *bonnebouche*. On the remainder of this ten-acre field, winter barley and tares are grown for the horses. By good cultivation, heavy manuring, and changing of crops about, the field continues to do very well for green and root crops, although it has been growing them now for a good many years. There is, in fact, a lot of virtue in farmyard manure, when it has been made from cake and corn; for my own part, I think such manure, made from a liberal consumption of decorticated cotton-cake, will produce better crops of meadow grass, whatever it may do of root crops, than perhaps any other kind of manure, liquid or solid.

A Perfect Little Dairy.

There is a perfect little dairy across the road from the buildings, a dairy with a thatched roof and overhanging eaves. Probably a thatched roof is about as good as anything can be for a dairy: it keeps out the heat of the sun and helps to regulate the temperature inside the room. The dairy at the College Farm is tastefully finished with Minton's tiles, slate benches, and porcelain milk-pans that are white, and smooth, and clean, and very attractive to look upon, as well as pleasant to use. They are not much wanted nowadays, however, for almost all the milk is sold: and, indeed, if it were not, the cream is obtained to greater advantage by a separator. The dairy, however, is there, and may be used if it is wanted. It was equipped with pans for cream-setting before the separator became such a potent instrument of the dairy, and many of them perhaps will never be wanted again, there, for the purpose. Cream-raising in pans will never become wholly a thing of the past, but henceforth the separator will be king in a large butter dairy, or in an establishment where milk and cream are produced and sold. This is not the only dairy standing idle, so to speak, in the country.

In many dairying counties there are scores and hundreds

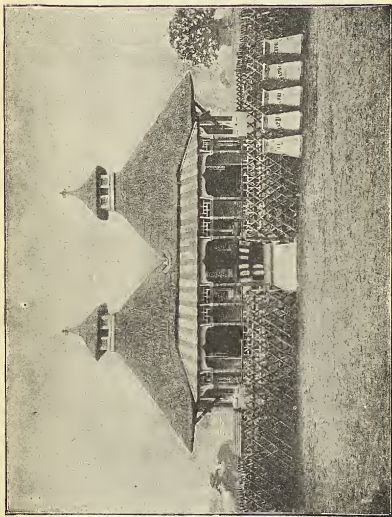


FIG. 3.—THE DAIRY, COLLEGE FARM.

which are not wanted now; the milk trade has closed them until the time when they may haply be wanted in the future. So far as we can see at present, however, not only are they not likely to be wanted again for years to come, save perhaps occasionally when there is a plethora of milk in the summer, but it will perhaps be worse for dairying at large if they should be wanted much in the future. At the same time, it may occur in a few years' time that butter-making and cheese-making, too, may again become profitable enough to induce a good many milk-selling farmers to give up the trade. Meantime the dairy at Finchley exists as a part of the original plan of the premises; yet it is now but little more than an ornament.

The Live Stock.

The cattle consist of pedigree animals, carefully bred and trained for milk as well as flesh. The Guernseys, however, are not, as the Shorthorns are, susceptible of being made first-rate butchers' cattle. Many prizes have been taken by each of the three breeds—Guernseys, Shorthorns, and Kerrys—but the Guernseys are the leading breed, because of the extraordinary richness of their milk, of which, for medium-sized animals, they yield a large quantity. For a high-class milk trade, it may be doubted if any other breed would answer the purposes so well. The little Kerrys also yield very rich milk, and, for the size of them, a large quantity of it. It may be taken for granted that a mixture of Guernsey, Kerry, and Shorthorn milk will give entire satisfaction to the most fastidious of customers. High-class bulls of each breed are kept for service, and everything is done to ensure purity and excellence of type all round. I could not help thinking how deplorable the misfortune would be if pleuro-pneumonia, or anthrax, or rinderpest were to invade the premises at the College Farm, for herds like these are not built up in a day.

One of the Shire mares is by "Defiance," by "What's Wanted," and she was in foal to "Bar None." Another is by "King Charles," dam by "Dragoman," and she was in foal



FIG. 4.—THE KERRY HERD AT PASTURE.

to "Bradley." These mares and the other two Shires that are kept fetch grains from the brewery and manures from the stables in London, and do whatever horse-work there may be on the farm.

A number of pure-bred poultry are kept in an excellent set of poultry-houses. Minorcas are liked best for laying, and Leg-horns, Old English Game, Cuckoo Dorkings, and Plymouth Rocks for table poultry.

The farm herewith described is a model as well as an ideal farm. It is practically a grass-land farm, for only one field of it is under the plough. The advantage of location is made the most of in the retail milk trade. Consequently it can be regarded as a typical farm only in so far as a trade of that nature is concerned, and it is one of a not very numerous class. More than 90 per cent., no doubt, of the dairy farms of England possess no such excellent facilities for the retail sale of milk. But it is a specimen selected for notice because it offers an example which may be followed with advantage in suitable localities, and also because, in a period of prolonged agricultural depression, it provides a pleasant picture of prosperous suburban farming.

CHAPTER II.

THE BEST BREEDS OF DAIRY CATTLE.

Milk-yielding Capacity.—The Shorthorns.—Milk *versus* Beef.—Ayrshires.—Red Polled Cattle.—Jerseys and Guernseys.—Kerrys.

WAS it not in *Household Words* that Dickens said: "Should mankind ever return to the worship of animals, the Cow would become the chief Divinity"? In this striking and beautiful figure of speech our great humourist gave expression to the very high estimation in which the cow is nowadays held by all the most civilised and progressive of nations, with, perhaps, the single exception of Japan. And who shall say that the great moralist's fanciful idea is altogether impossible or even improbable? or that such worship would degrade the human mind as many forms of worship do which still exist on the earth, or which have passed away? It may be said, in any case, of all the different species in the animal world, that which is represented by the Cow is the one we could least afford to do without; and it therefore follows that, to say the least, we are bound to entertain a good deal of respect for the animal which is so immensely valuable to the human race.

With the man—whoever he may have been—who is traditionally said to have "kissed his cow," we may venture to admit that we feel a bit of willing sympathy.

Milk-yielding Capacity.

One of the most remarkable facts in connection with pedigree cattle-breeding during the last twenty years is the superior

value which is now accorded to the milk-yielding capacity of cows, as compared with the beginning of the period. Up to the seventies, milk was regarded as of quite secondary, and now it is of primary, importance. In nearly all of the leading pedigree herds of Shorthorns, for example, milk was deliberately sacrificed to other qualities—to beauty of form, early maturity, aptitude to fatten, and so on—in order to develop and strengthen these, as it was thought. No doubt the expanding milk trade, which has grown to such enormous dimensions since 1875, and the advent of cheese factories, which occurred in 1870, had a good deal of influence in bringing about the change I have alluded to in favour of the production of milk as the chief aim and purpose of a cow's existence. But earlier still it began to be suspected that we had been breeding our aristocratic Shorthorns too much away from milk, and the milk trade and the cheese factories brought out and emphasised a very practical expression of that suspicion. For, after all, it is the dairy farmers upon whom Shorthorn breeders depend to buy a good many of their young bulls.

It is not egotism on our part to say that no other country can pretend to possess breeds of dairy cattle equal to those which are natives of the British Isles. If there were other breeds elsewhere as good, or nearly as good, as the half-dozen of our own especial dairy breeds that we are properly and reasonably proud of, it is certain that we should have given them a trial long ago, and should have kept them if they were worth keeping. Not that we are dissatisfied with our own, or that we should like to change them for others; it is simply because if there is anything good in the animal world, in any country, we like to have it for sake of comparison no less than for love of variety.

Speaking personally, I may say that I have not, in any country near to us—in France, or Holland, or Germany, or Switzerland, or Belgium—seen dairy cows that took my fancy very much; and that only in the magnificent valley of Texcoco, wherein stands the very interesting city of Mexico, have I seen a breed of cattle other than British that I

would much like to possess. These were polled cattle, quite as variously coloured as any of our own breeds, and more so than most of them, well-formed animals, and apparently good milkers; but, as they are natives of a tropical country, in a valley whose climate is no less delightful than its scenery is charming, it may be expected that they would not easily suit themselves to the damp and cold of the British Islands.

The Shorthorns.

Though I am free to admit that the production of both quantity and quality of milk form the chief duties of a dairy cow, there are other qualities which must also be cultivated and developed. We want a cow to give good milk and plenty of it; but when her career at the milking-pail is over, we want her to convert herself as quickly as she conveniently can into a big and good carcass of beef for the butcher; and so shall her days be speedily and pleasantly ended, for she knows not anything of the future. What we want of her is to yield plenary profit, alike in her life and in her death—to give us liquid milk as long as she can, and solid flesh when she cannot. And hence it is that the Shorthorns are regarded as, on the whole, the best dairy cows the world has so far produced, although our American friends aver that they are not dairy cattle at all, but beef cattle; which is mere fun on the face of it.

Take into consideration milk only, if you like, and abjure everything else; then are the Shorthorns "open to be whipped" by several breeds that are not much more than half as big as they. And, indeed, taking all qualities into consideration, the question of size of animal and of the food she eats should be regarded along with the milk she gives. Where milk can be sold at fourpence a quart, and a cow is kept five or six years in the dairy, it may be that the smaller breeds would not be behind the bigger ones in profit to the farmer, even though as butchers, beasts they are not worth more than half as much. But then, it commonly happens that a cow runs barren after one or two

seasons of milking, and here it is that the bigger breeds are seen to the greatest advantage.



FIG. 5.—BOOTH SHORTHORN HEIFER, "BRACELET."
The Property of Her Majesty the Queen.

In the old days, when the Collings, and Maynards, and Milbanks, and Hutchinsons, and a hundred others perhaps,

were breeding improved "Durhams," copious milking was held to be important, and the old "Teeswaters" of two or three centuries ago were celebrated for yielding larger quantities of milk than any other breed yet known in these islands. An ancient record is said to be still preserved in Durham, and to state that cattle of great excellence existed in the county as long ago as the middle of the fifteenth century. The cattle alluded to were progenitors of the Shorthorns which have become famous the world over in our own time.

High in the north-east tower of Durham Cathedral, outside, there is in high relief a statue of an unmistakable Shorthorn cow, with the milkmaids standing by. The original statue dated from about the year 1300, and the tradition attaching to it relates to the monks of old, who, when lost, were directed on their way to Dunholme—now Durham—by the dairymaids, when they were taking the body of St. Cuthbert for re-interment where the cathedral now stands. The statue was put in from gratitude to the dairymaids, whose cows had strayed to Dunholme.

It can hardly have been from an undesigned development of the lacteal organs that these ancient cattle should have given a copious wealth of milk; for it is generally accepted that such a departure from what is known to be general with wild herds of cattle, and with not a few tame ones, is a natural function artificially developed. Nor can it have been, when the Shorthorns of old roamed wild in the forests and vales of the northern counties of England, a question of climatic requirements on the part of the offspring, for this would tell with greater force in Scotland, none of whose original breeds have been much celebrated for milk. Indeed, in view of the modern fact that fashionable Shorthorns had been so far bred away from milk that wet-nurses were required for the calves, we may reasonably infer that as the milk-yielding capacity of a breed of cows can be diminished by the control of man, so can it be developed when an opposite line of conduct is pursued. But it must be remembered that neither can it be diminished nor developed in one generation, or two, or even in three or four, to such an extent as to entitle it to be regarded as hereditary.

The admission has had to be made, and regretfully made, that the milk-yielding capacity of many families of pedigree shorthorns was deliberately and intentionally reduced, not to say sacrificed, and for a purpose, viz., to maintain the "condition"—that is, the fatness and fleshiness of the cows. This led down to the inevitable loss of popularity which bulls from these families sustained in the estimation of practical dairy farmers, who had been in the habit of buying them, and so after a time came a collapse of the inflated values which had astonished the world in the roaring seventies. During the period of inflation, intrinsic value had no connection whatever with the prices fetched by fashionably-bred Shorthorns prior to the eighties. The period was one of inflation in many things, but in nothing, perhaps, to such an extent as in pedigree Shorthorn cattle. It was the misfortune and not the fault of these noble cattle that they became identified with so much of what can hardly be distinguished from gambling, for it led to their being bred and trained to give up one of the chief functions coincident with maternity, viz., the maintenance of their offspring. In the interests—the best and real interests—of the best all-round breed of cattle the world has yet produced, it is to be hoped that this sort of thing will not again be carried far in the direction of extremes, and that milking capacity may continue to be cultivated along with other qualities toward which the breed has shown a striking aptitude. The breed has ample merit in various ways, and will now, we hope, work out its destiny without let or hindrance.

Milk *versus* Beef.

The ancient reputation for milk which the Shorthorns possessed belongs to a period when beef was at present Australian prices, when milk was the chief merit of a cow, when professional graziers did not exist, when barren cows were worth next to nothing in the springtime of the year, and when beef was not by any means so general an article of food as it has become in our own days. It is, indeed, owing to the steady and rapid

increase of wealth among the mining and manufacturing populations of these islands, that the flesh of cattle became so general and popular an article of food, and that, consequently, cows were endowed with potential profit other than that of milk. And so it came to pass that milk relatively went down in the estimation of breeders, and beef went up.

But a turn of the tide set in when the great trade in American beef was developed with startling suddenness in this country, and it was seen to have been a mistake to have let the Shorthorns fall so far away from milk. The mistake was brought home somewhat unpleasantly to the breeders, when dairy farmers wanted pedigree bulls from herds whose cows were known to be good milkers, and looked askance at those that were not. And so it is that nowadays milking properties are being carefully cultivated in all breeds of cows that have any serious claim to be considered dairy cattle at all.

This is, of course, as it should always have been: as it indeed was, in the old days of the Shorthorns. And as this most famous and most valuable of all breeds is well known to be susceptible of a high lacteal development, there can be no doubt that the property will be developed and improved as perhaps it has not aforetime been.

Good, roomy Shorthorns, well bred, well raised, well trained, will yield 15 or 16 quarts at a meal, in not a few instances, though of course this cannot be sustained through very many weeks. Cows of this breed are reputed to have yielded upwards of 1,000 gallons of milk, and there exists a record of one that gave 12,870 lbs., or about 1,255 gallons, in one year. It is probable, however, that the average yield of Shorthorn cows is less than 500 gallons per annum, especially if we reckon in the pedigree cows of some of the aristocratic herds.

The old Longhorns, which are now kept in a few places only, for antiquarian reasons chiefly, were general in the Midland counties up to about the beginning of the second quarter of the current century, but they have been most thoroughly "rooted out" by the Shorthorns, which now prevail in all the old Longhorn haunts. And yet these Longhorns had great merits in some

cases, notably for beef, in the hands of that king of breeders, Robert Bakewell, of Leicestershire. This great displacement of one celebrated breed by another was chiefly brought about by Shorthorn bulls, whose prepotency was such, when mated with Longhorn cows, that the old Longhorn characteristics have been wholly eliminated in little more than half a century.

The same sort of thing is in progress elsewhere, and at least two of the three Welsh breeds are vanishing before the invading and cosmopolitan Shorthorns, just as the Indians of America are vanishing before the white man. In reference alike to the Longhorns, the Pembrokes, the Glamorgans, and the Indians too, we see at work Darwin's "survival of the fittest"—the great natural law which regulates families, tribes, nations, and species; and which has produced the well-defined forms of animal and vegetable life as we see them to-day.

Ayrshires.

It may well be doubted if, as purely dairy cattle, suitable for cheese-making or the milk trade, there is a breed in the British Islands that will surpass the Ayrshires. For producing a maximum quantity of milk from a minimum quantity of an inferior quality of food, and for thriving in an uncongenial climate on land that is only of moderate fertility, there are no cattle superior to the Ayrshires; while for vigour and hardihood of constitution, for energy and strength of will, and for industry and activity in search of food where food is not too plentiful, the Ayrshire cow has probably no equal. Many judges consider that the build and outline of a first-rate specimen of the Ayrshire cattle is as nearly as possible the ideal of what a dairy cow should be: that is, she is light and narrow in her forequarters, but wide and spacious behind. But the Ayrshire cow has certain faults. In the first place, she is decidedly inferior to any other of the Scotch breeds, or to any of the English breeds save the Jerseys and Guernseys, as a beef-producing animal; in the second, she has short and stumpy teats, which add to the difficulty of milking her; and, lastly, she has an untiring pugnacity of disposition which is a frequent cause of injury to her fellows, so that it is

a wise precaution to tip her horns with knobs of wood or iron. But she is an excellent milker, yielding for her size more of the

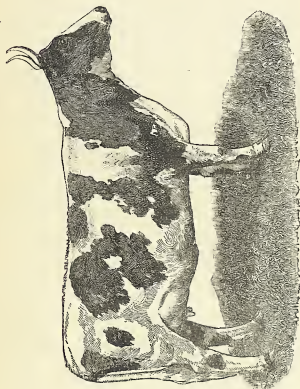


FIG. 6.—AVONSHIRE COW, "BERTIE 2ND."
The property of Sir Mark J. Stewart, Bart., M.P.

lacteal fluid, probably, than any other breed the world has yet produced.

It is said that the milk of Ayrshire cows is peculiarly well adapted for cheese-making purposes, owing to the butter-fat being more minutely diffuse than, for instance, in the milk of Jersey cattle. Be this as it may, finer Cheddar cheese cannot be made, even in Somersetshire—good judges admit—than that which comes from the best dairies in Galloway; and I am able to speak to the admirable butter-yielding capacity of an Ayrshire cow I once possessed. This cow produced, during a good many weeks in summer, an average of 2 lbs. of butter per day, although a portion of both milk and cream was consumed and not credited to the churn. The Ayrshire cows do well in milk on land which would almost starve the Shorthorns, but at the same time they quickly respond to more generous feeding and to better land. The breed is comparatively modern, having been evolved by crosses between other breeds, to wit the Shorthorns, the West Highlanders, and possibly others—that is, the cattle of Cumberland, Westmoreland, and Northumberland; so, at least, it is now believed. Be this as it may, and be the breed as composite as that of Englishmen themselves, it is now a definite breed, with characteristics faithfully transmitted from generation to generation.

The Ayrshire Agricultural Association has adopted the following scale of points for Ayrshire cattle:—

1. Head short, forehead wide, nose fine between the muzzle and eyes, muzzle large, eyes full and lively, horns wide set on, inclining upwards (10 points).
2. Neck moderately long and straight from the head to the top of the shoulder, free from loose skin on the under side, fine at its junction with the head, and enlarging symmetrically towards the shoulders (5 points).
3. Fore-quarters: shoulders sloping, withers fine, chest sufficiently broad and deep to ensure constitution, brisket and whole fore-quarters light, the bow gradually increasing in depth and width backward (5 points).
4. Back short and straight, spine well defined, especially at the shoulders; short ribs, arched; the body deep at the flanks (10 points).
5. Hind-quarters long, broad, and straight, hook bones wide apart, and not overlaid with fat, thighs deep and broad, tail long, slender, and set on level with the back (8 points).
6. Udder capacious and not fleshy, hinder part broad and firmly attached to the body, the sole nearly level and extending well forward; milk veins

about udder and abdomen well developed ; the teats from 2 ins. to $2\frac{1}{2}$ ins in length, equal in thickness, the thickness being in proportion to the length, hanging perpendicularly ; their distance apart at the sides should be equal to about one-third of the length of the vessel, and across to about one-half of the breadth (33 points).

7. Legs short in proportion to size, the bones fine, the joints firm (3 points).

8. Skin soft and elastic, and covered with soft, close, woolly hair (5 points).

9. Colour red, of any shade ; brown or white, or a mixture of these, each colour being distinctly defined. Brindle or black-and-white are not in favour (3 points).

10. Average live weight in full milk, about $10\frac{1}{2}$ cwt. (8 points).

11. General appearance, including style and movement (10 points).

Total, 100 points.

Red Polled Cattle.

This breed is believed to be essentially and originally a native of Norfolk and Suffolk, but is now to be found in many counties and countries. The origin of the breed is involved in some obscurity, but there is no doubt of its ancient character. If the Ayrshires are pugnacious, the Red Polls provide us with a contrast, for they are among the most docile of cattle. How far this docility may be owing to the absence of horns it is not easy to say ; but at all events cattle that have horns have something to fight with, and know it. The Red Polls, unlike the Black Polls of Scotland, are certainly good milkers, and entitled to a position among the half-dozen of our best dairy breeds. They are also good graziers, though not equal in this respect to the Shorthorns, Herefords, or the two breeds of Scotch Polled cattle.

The popularity of the Red Polls has greatly increased, or rather extended, in recent years. In their native counties they have been thought much of during a long period of time, and it must be admitted that as a breed they are amongst the most desirable of our bovine possessions. Some writers have surmised that the breed is at all events partly Scotch : and when we reflect that red was a common colour in bygone times among the polled cattle of Scotland, and that large numbers of

Scotch cattle in the old days came in droves to be fattened in the winter fold-yards of various corn and root-growing English

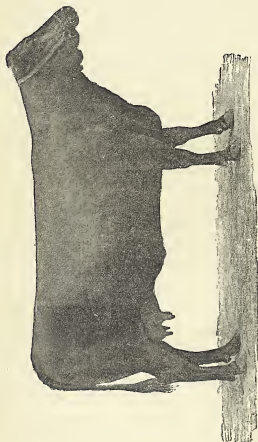


FIG. 7.—RED POLLED COW, "EXHIBIT."

Winner of the Champion Prize given by the Red Polled Society for the best female in the Red Polled classes, at the Jubilee Show of the Royal Agricultural Society of England, Windsor, 1889. Bred and exhibited by Mr. W. A. Tyssen-Amherst, M.P. (Lord Amherst), of Didlington Hall, Brandon, Norfolk.

counties, it seems possible, and even probable, that some of them may have mixed their blood with the indigenous cattle of

Norfolk and Suffolk, which were not always red as they now are, and so may have contributed to form the breed as we see it to-day. It were no discredit to the breed, if true.

It may, however, be said that some of the breeders of these cattle of to-day stoutly deny this Scotch admixture, and declare the Red Polls to be the pure descendants of the ancient cattle of Norfolk and Suffolk. This dispute, if dispute

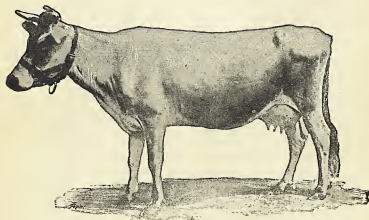


FIG. 8.—JERSEY COW, "HER MAJESTY."

First at the Royal Society Show at Carlisle, &c.

The Property of Geo. Simpson, Wray Park, Reigate, Surrey.

it amounts to, I cannot pretend to solve, and we may doubt if the bottom truth concerning it can ever now be finally ascertained.

Jerseys and Guernseys.

These natives of the two Channel Islands whose names they bear are dairy cattle to all intents and purposes, and are celebrated for yielding milk uncommonly rich in butter fat. They are wholly distinct breeds, quite as much so as any other two breeds in the country, and the purity of their blood has for a long time been carefully guarded by the local authorities. The

peculiarly rich milk they yield is a quality made hereditary partly by the genial climate of the Islands and partly by the



FIG. 9.—GUERNSEY COW, "PRETTY DAIRY MAID."

Winner of the Champion Prize given by the Royal Guernsey Agricultural Society for the best female in the Guernsey classes, at the Jubilee Show of the Royal Agricultural Society of England, Windsor, 1882. Bred by Mr. Robert Best, of St. Andrew's, Guernsey. Exhibited by Mr. D. O. Le Pasourel, of Les Quartiers, St. Sampson's, Guernsey.

kindly way in which they have been treated for many generations. In point of fact, there are no breeds elsewhere whose

breeding and management for centuries have been more carefully attended to. They are, of course, by nature and habit unsuited to rigorous climates, but for all that they are held in high esteem in the United States and Canada. The Jerseys are particularly elegant and pleasing in form and colour, the latter being commonly a fawn or a silver grey, and they are constantly much sought after as ornaments to the grounds of country gentlemen.

The Guernseys are larger, coarser, less shapely, and their colour is a dull yellow patched with white; yet they are perhaps the more profitable of the two. These two breeds have been maintained in their purity by local Acts of Parliament which forbid the importation of other breeds into the Islands. So, at least, it is understood. However this may be, it may be taken for granted that the British Islands do not possess a breed more nearly pure, as breed is understood. The butter they yield—and they are essentially butter cows—is deeper and richer in colour than that of any other breed, and needs no artificial colouring. Some farmers, indeed, have a few Jersey or Guernsey cows, in order to improve the quality of the milk yielded by the rest, particularly when butter-making is a speciality. Americans think the Jerseys indispensable to the production of what they call “gilt-edged butter!”

Kerrys.

Last, and least of all, we come to the one indigenous breed of Ireland, the quaint, and gentle, and useful little Kerry, whose native home is in the south of the Emerald Isle. Ten years ago the Kerrys were hardly known outside the genial island to which they belong, but now they are thought a good deal of in various parts of England. They are, in fact, growing in favour, and are being sent to various parts of the world. Their colour is black, and their size but little greater than a donkey's. A sub-variety, known as Dexter Kerrys, is not always all black. The milk yielded by these little cows is next to that of Jerseys and Guernseys in richness of butter fat, and they are consequently excellent butter-cows. They are hardy, wiry, vigorous in their

way, capable of making a good living among the heather-clad mountain sides of their native country, or in the lanes, or on poor land anywhere, though, of course, they will do better on better lands. They are the poor man's cows *par excellence*, though many rich men have taken to them of late, and it is very likely that their popularity will go on increasing.

Here we have half a dozen of the best breeds of dairy cattle, and the list might be extended by including the Devons; yet, after all, the Devons are considered more as beef than as milk



FIG. 10.—DEXTER KERRY COW, "ROSEMARY."

Winner of First Prize at the Jubilee Show of the Royal Agricultural Society of England, Windsor, 1889. Exhibited by Mr. Martin J. Sutton, Kidmore Grange, Caversham, Oxon.

producers, though some of them have pretty high claims in reference to milk, particularly in reference to richness of milk. But, in any case, half a dozen excellent breeds provide us with choice enough for all practical purposes, and we may fairly congratulate ourselves that we possess them in all reasonable abundance. The Shorthorns, all things considered, stand and must stand at the head of the list, but they are most worthily supplemented by the others of which I have spoken. The milk of the Shorthorns is not of the richest, and this may be owing to their northern origin; and, indeed, it is to be noticed

that breeds of cattle whose habitat is in a genial climate, or which belong to southern districts, give milk of an unusually rich quality. Perhaps the most striking fact in connection with our breeds of cattle is this, viz., that in this little country we have a variety far greater than those can supply which are native to any other equal area of the earth's surface, and all of them excellent.

It is not only interesting, but also significant, to reflect on the

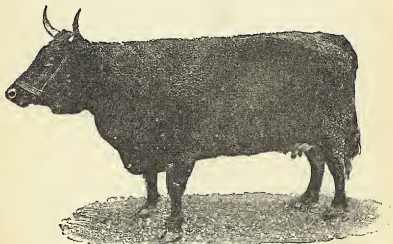


FIG. 11.—NORTH DEVON COW, "FAIRMAID," 9351 D.D.H.B.
A Royal Winner in 1888.

The Property of Sir W. R. Williams, Bart., Heanton, Barnstaple, North Devon.

demand which exists for most of our breeds of cattle all over the world where the English language is spoken. The Englishman, of course, is ubiquitous—that had become inevitable—and the cattle of his island are almost equally so. They were wanted, as he was, to colonise the "wild land" of the world—wherever it is good: and they will be wanted all through the future to replenish and sustain the colonists. Let us guard them well, and improve them as much as we can, for they are a goodly inheritance!

CHAPTER III.

THE BREEDING AND TREATMENT OF DAIRY CATTLE.

Improving Breeds.—Purity of Breed.—A Good Bull.—Pedigree Bulls.
— Crossing. — Purchasing Cows. — Feeding. — Housing. — General Treatment.

THE success and enjoyment of a dairy farmer—the latter depending on the former—are in no small degree the result of his skill and judgment in selecting, to begin with, and in mating together for breeding purposes the animals of which his dairy herd is composed: first buying some, and then breeding all he needs—breeding them up to a model framed in his own mind. In some men this skill is an intuition, which is generally improved by thought and experience. Others work it out for themselves, without having been born with any great natural talent in that direction. Yet others there are who do not acquire it, and do not even try, and in these cases no progress is made and no success attained. And so it is that, so far as quality is concerned, we may find in many districts a great difference in the cattle that are bred.

In a preceding chapter I mentioned Bakewell, of Dishley, whose reputation stands to the effect that he had a marvellous natural and cultivated talent for mating animals together in such a way that faults of dam or sire were reproduced in a diminished degree, or not reproduced at all, in the offspring; while at the same time the good points of either or both were not only preserved but also developed. It was a natural gift in this man, and he worked it out with wonderful success in a period when the art of breeding was not popular

and understood, as it has since become. He took in hand a breed of cattle—the Longhorn—whose greatest fame both rose and fell with him. He was even more successful with the Leicester sheep, and his rams fetched prices which astonished the world. His success in cattle breeding would no doubt have been as marked and brilliant as it was in the domain of sheep, if only he had taken in hand the Short-horns instead of the Longhorns. This, however, was a matter of circumstance rather than choice; the Longhorns were in his day the prevailing bovine stock of the Midland Counties, and

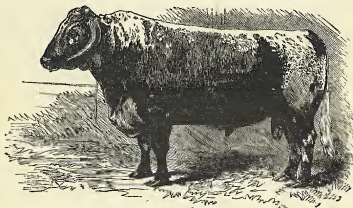


FIG. 12.—LONGHORN BULL.

he took in hand the materials lying nearest to him. But to him belongs the undying credit of having given to stock-breeding, just at the period when it had become imperative, the impetus which sufficed to lead up to the splendid results of to-day. He had a theory of breeding, no doubt, and that he should have left no record of it is a fact greatly to be deplored by every breeder who has succeeded him. Yet at the same time others copied, willingly so far as he was concerned, the arts by which he succeeded; and of those who paid him visits for the purpose, Charles Colling has left the greatest name.

Improving Breeds.

The question of heredity, which is epitomised in the word "pedigree," is of the greatest possible importance in the art of breeding improved animals of any kind. Heredity includes good and bad qualities alike, which are transmitted from parent to offspring, and the art of breeding consists quite as much in wiping out bad qualities as in developing good ones. A fault of form, for example, which is hereditary in any given cow, may be improved away by mating her, and also her female offspring through several generations, with bulls bred from families of cows in whom that particular fault does not occur. Faults, too, of colour, of constitution, of size, of bone, of milking properties, or of almost anything else, save perhaps of actual and positive organic disease, may similarly be disestablished by breeding against them through several generations. But at the same time it must be borne in mind that while these faults cannot be considered as having been finally eradicated until three or four generations have shown no tendency to revert to them, it is only too easy to reintroduce them by using a bull from a herd in which they still exist.

There is, unfortunately, a tendency of this sort in the animal world—a tendency to return to bygone types or peculiarities, many of which, if not all, are undesirable—and a breeder cannot be sure that he has completely mastered it until he has seen no evidence of it in the last three or four generations of his cattle; even then it requires to be guarded against just as carefully as it was fought against, in order to prevent its reintroduction. It has been found by Charles Darwin, the greatest naturalist of all time, that cross-breeding gives a more or less definite impulse towards characters long before lost or got rid of; and the introduction of fresh blood, especially if it be entirely unrelated, though of the same species or breed, may be easily followed by the restoration of some earlier and unimproved type. This is the danger which breeders have sought to avoid by "breeding in-and-in," as the constant mating of closely-related animals is termed; but while

there can be no doubt of the success of this line of breeding in the object desired, there is the danger of infertility and tuberculosis if the line be followed very far.

Purity of Breed.

But, on the other hand, purity of breed may be maintained without necessarily incurring the danger of developing disease and destroying fertility. Fresh blood repeatedly introduced is necessary in order to avoid the danger spoken of; but it must be blood of the same strain and tribe, if purity of breed is to be preserved. The danger only exists when closely-related animals—males and females of the same herd or family—interbreed generation after generation, to the exclusion of outside relations. But in most of our distinct breeds of cattle, and particularly in the Shorthorns, there are many pure-bred herds of one particular strain or other—of Booth or Bates blood, for example—and these herds can supply to each other all the fresh blood that is necessary to preserve the vigour and soundness of cattle. And, indeed, if such fresh blood of the same strain be introduced from other soils and climates, and even other countries rather than from the same neighbourhood, the benefit will or may be all the greater. I am not aware that any great benefit has been derived from the few Shorthorns that have been brought to this country from Canada; the Americans, however, perhaps even more than the Canadians, have found and will continue to find it advisable to repeatedly and constantly obtain Shorthorns from Great Britain. But, in any case, it is generally an advantage to get bulls from the Northern Counties down into the Midlands, and from a limestone soil to any other kind on which cattle are kept. In the case of cereals—of oats, at all events—it is better to fetch them from the north than from the south. Most of our various breeds of cattle have now been bred towards a given model for each breed, wherever any pains at all have been taken. The approved model of a Shorthorn, an Ayrshire, or a Jersey, for instance, is well understood, and all breeders of note have

aimed at this model; so that there is no great difficulty in getting all the fresh blood required, without incurring danger to the model.

A Good Bull.

It has been pertinently said that "the bull is half the herd," and it is therefore of the greatest importance that only good bulls should ever be allowed to propagate the species. But what is a good bull? A well-formed, well-grown animal of

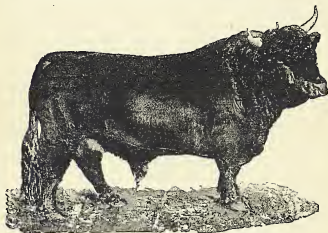


FIG. 13.—DEXTER KERRY BULL, "PARADOX."

The property of Mr. Martin J. Sutton, Kidmore Grange, Caversham, Oxon.

good colour and constitution is not by any means necessarily a good bull, though a good bull must possess these qualities. I have elsewhere written: "The capacity of a bull to transmit to his offspring his own peculiar properties, or mould, or excellences of any kind depends on his having inherited them from a succession of ancestors endowed with similar characteristics." There is many a good-looking bull, not true-bred as to qualities, whose power of impressing his good looks or other points of merit on his offspring has been found illusory, and this for

two reasons—viz., his lack of prepotency, and the fact that his own ancestry has been bred in the happy-go-lucky manner so common in the country. Such a bull, if he has a promising appearance, is so far a fortunate accident of nature, but there is no certainty whatever that his offspring will be as good-looking as he; the certainty indeed is that it will not, if there is any certainty about it.

On the other hand, it occurs often enough that thoroughly well-bred bulls, and cows too, do not show up as well as they ought, or as they were reasonably expected to do, and so far are not ornaments of the families to which they belong. Yet animals like these are always worth buying, and frequently well worth buying, at the moderate prices to which their want of good looks has consigned them. They are worth buying, because—their want of good looks being merely an accident of nature—they will in all probability produce offspring much better looking than themselves. This sort of reasoning is applicable not only to looks, but to qualities too, as a general thing. The rank and file of dairy farmers cannot well afford to buy the good-looking young bulls that fetch fancy prices, or used to fetch them; and indeed they may rest content as a rule with the plainer sires, for these will probably “nick in” with their cows just about as well as the others. But in respect of either sort, it is a *sine quâ non* that the bull should have a healthy and vigorous constitution, and not have been pampered and coddled too much—should, indeed, not have been pampered or coddled at all—but just brought up on good plain food, and in a hardy sort of way as to housing and general treatment. In any case, the “greenhouse” way of rearing young bulls is played out, once for all, so far as practical dairy farmers are concerned.

Pedigree Bulls.

The sort of cows that dairy farmers should aim to breed are they which possess milk, size, condition, and good looks. These are the qualities that command a good price in the market, and dairy farmers must needs be always breeding and

always selling. Pedigree herds are the "upper ten" of bovine society, and dairy farmers who are in business for profit, and not for a hobby, cannot afford to have much to do with them. Indeed, pedigree bulls are sometimes a delusion and a snare when brought into an ordinary herd. I have known two marked instances of this. One of these bulls got very few calves, and those not very good ones; the other got plenty—too many, in fact—and scarcely any of them were equal to their mothers. This last one, indeed, very seriously lowered the quality of a high-class, non-pedigree herd, which belonged to an old friend of mine who is now gathered to his fathers.

But, on the other hand, I have known a case where a pedigree bull had qualities so marked and commanding that his impress was clearly enough seen for many generations among the cattle of the neighbourhood. All this is a lottery, as matrimony is said to be. It would, however, be much less a lottery if those who buy bulls, be they pedigree or not, would take sufficient pains to assure themselves that the qualities they want in the bulls are hereditary, and not merely accidental. In order that the bull may improve the herd, he must needs come of a family which has long been noted for soundness and vigour of constitution; otherwise he will not influence the offspring very much to their advantage. But if he possess that strength, and soundness, and vigour, his influence will be seen in many generations. This, indeed, is prepotency, and it comes, like other functions, within the meaning of heredity.

Crossing.

The offspring of a cross between two animals of the same breed, but not of the same family or even related in blood, is generally strong and vigorous, sometimes more so than either of the parents; whereas, on the other hand, close in-breeding tends towards delicacy of the constitution and weakness of some of the functions. From this latter condition of things it is easy to develop the disease known as tuberculosis. This, however, is not exactly "crossing," in the ordinary acceptation

of the word. Intercourse of a sexual nature between animals of distinct breeds—as between Shorthorns and Galloways, or between Herefords and Glamorgans—is essentially crossing, and the offspring of a raw and first cross of this sort is usually a most vigorous and healthy animal, if neither of the parents is diseased. In any case, to breed from animals that are diseased or unsound in any respect is, to put it mildly, a mistake; such animals should not be allowed the opportunity of procreating, for unsoundness is distinctly hereditary, and disease in a parent will commonly reappear in offspring.

It seems to be well established that Nature looks with approval on blood-mixing within the limits of a given species, rather than on the family exclusiveness which, in the breeding of pedigree stock, has been too frequently promoted. This refers to the animal world in general, including Man himself. How far the greatness of the British race is owing to the fact that "Saxon, and Norman, and Dane are we"—as Tennyson put it—I will leave others to say, but the fact remains that as a nation we are considerably mixed in blood. This suggested illustration may serve as a point of study in the breeding of domesticated animals, and I may refer to the Shorthorns by way of analogy.

One of the most successful dairy farmers I have known followed a plan of breeding which is worth relating, and found it answer his purpose thoroughly well. He never bred any cows for his own dairy, but bought as many promising heifers as he wanted, of the ordinary Shorthorn breed of the Fylde of Lancashire, year after year, and had them put to a pedigree bull. The bull was always a thoroughly good one, but as a matter of preference did not come from a milking family. His prepotency showed itself in the calves, which ran to beef at an early age, and were almost invariably fed off for the butcher while still they had their "calf-flesh" upon them. This sort of thing cannot be generally followed, we know; but it is an instance, remarkable enough in its way, of breeding for a special and intelligible purpose.

Whenever it is desirable to feed off animals in this way for

the butcher, it would be false policy to let them lose their "calf-flesh," as it is termed: that is, these young animals ought to be kept steadily and rapidly progressing toward obesity from their birth. And when female calves are reared for the dairy herd, it is also advisable to keep them steadily progressing, but not so rapidly as in the other case. There is and can be no advantage whatever deserving the name in letting young store animals down into the lean, half-starved, unprogressive condition which is far too common in the land. The true and sound policy is to keep them thriving all the time, rapidly when they are for the butcher, and slowly when they are for the herd.

Purchasing Cows.

A new beginner will, as a rule, be well advised to buy roomy, healthy, promising young cows of the district in which he decides to settle, providing they are of a good sort. It is understood that cattle bred in the district, if of a good sort, will do quite as well as, if not better than, cattle of equal merit coming from a distance. There are, however, plenty of cases where it is advisable to fetch them from a distance, from sound land and a bracing climate. To buy them in high condition and at high prices is seldom a wise thing to do; for he should aim to make condition, not buy it; and this he will do successfully enough if the cattle come from land not so good as his own. In this way he may, at a moderate cost, lay down the foundation of a herd which, in a few years' time, ought to be greatly improved. This improvement will be brought about by the use of superior bulls and by careful management. To do this and do it well ought to be not only profitable but deeply interesting; for what greater pleasure can a dairy farmer have in his business than that of seeing his herd obviously improve on his hands year after year? But if he buys first-class cows to begin with, he deprives himself of this one great interest and pleasure. In any case, it is a blunder to buy low-class cattle, and to go on breeding such, for they are of no account when bred; moreover, it is just as easy to breed good

ones and far pleasanter. Land that will sustain good cattle is slighted if bad ones are kept upon it, and land that will not sustain good cattle should be avoided as one would avoid the plague. Such land, indeed, is a plague enough in itself, and so are low-class cattle. Good cattle will always yield a better return than bad ones for the food they eat; they have an aptitude for yielding a good return and bad ones haven't. Take, for instance, the question of milk: cows bred for milk will yield more of it and of a better quality, on a given quantity and quality of food, than cows not bred for milk can possibly be made to do. There is, in fact, far more in breed than in feed for milk, and this is a fact in natural history which every dairy farmer should constantly bear in mind. Feed inferior milkers as generously as you like, and you cannot raise their milk yield above a narrow limit. This limit is soon reached in such cows, whereas in cows naturally inclined to milk well, the limit is not easily reached.

Feeding.

Well-bred cattle, properly fed from the start and not pampered, are quite as cheaply maintained as any other sort. In respect to food, they either eat less or make more progress than inferior sorts. But they are not wanted to eat less, for the more they eat the better, within limits, if only they make a corresponding return in milk or in beef, as the case may be; and when they are through as milkers, the sooner they make beef the better. It is quite possible, though not always easy, to breed cattle that are very good for both purposes, and it is certain that cattle well bred in this way will give more milk and fatten quicker for the butcher than will inferior cattle. It is pitiable to see how little milk some cows will condescend to give, even on good land, and you may as well try to fatten a five-barred gate as some of these. Feed them how you will, they either cannot eat enough or they waste a good deal of it in the process of digestion. In all breeds there are good, bad, and indifferent cattle; but it is the good ones that pay the

best, under suitable conditions. A cow's destiny is fulfilled if she produces several calves and a great deal of milk, both of



FIG. 14.—HIGHLAND HEIFER, "LADY FLORA."
The best Breed in the world for Beef. The property of the Right Hon. the
Earl of Southesk, K.T.

good quality, and last of all a good carcass of beef. Cows that breed and milk well, keeping up their flesh all the time,

are soon finished off for the shambles when the inexorable law of man's convenience requires it. Fleishy cows are always desirable, rather than lean kine that are always lean, if only they milk well; they suffer less from a fickle climate, and always attract better customers. What all practical dairy farmers aim at, ultimately, is profit; and this is best secured by having cows good for milk and flesh, and feeding them generously but not lavishly. The man who starves his cattle, be they good ones or only middling, secures the profit he deserves—viz., very little, or none at all. To feed cattle well, and to treat them kindly, will earn a man profit while he lives and peace at the end. Try it, everybody, and see.

Housing.

In a state of domestication, animals become habituated to shelter from severe weather, and they must have it; but if they were allowed to relapse into a feral state they would necessarily learn to do without it. Shelter, however, has become a necessity to them in time of storms, and frosts, and snows, though there are farmers not a few who appear not to think so. And so it is that cows are commonly left out in damp and cold, far too late in the fall of the year, night and day alike, even when the weather, pitilessly wet and cold as it so generally is in October and November, punishes them severely. We may commonly see them, in the late autumn and early winter months, standing with arched backs in the insufficient shelter afforded by a wall, a hedge, or a plantation—this last by far the best of the three. It is not the cold that hurts them, or would hurt them, but the wet and the cold together. A dry cold is not much to be dreaded, though there will necessarily be a large consumption of carbon in the stomach to maintain the temperature of the system. But when in cold weather the cows' backs are constantly wet with rain, or sleet, or melting snow, evaporation is at work sucking out the warmth from the animals' bodies. This it is that punishes them most of all, and consumes most rapidly the heat-producing elements of the

food they eat. Many farmers are possessed of the idea that if cows are housed o' nights early in the fall of the year, their milk-yield at once falls off to some extent, and for this reason in part the cows are left out on the land, by night as well as by day, until even the most elementary notions of prudence can brook it no longer. The idea may be dubbed a ridiculous one, first, because it is erroneous, and also because in the case of those who entertain it there is no experimental basis on which it rests. The most common reason, however, why cows are left out too long in the nights of early winter is the desire to economise forage. Comparatively few dairy farmers have as a rule much more than barely enough hay and straw for any given winter, and, knowing this, they are anxious to save it as much as they can in the front end of the season. Economy, of course, is a merit which can only be condemned when it is carried too far, in which event it is no longer economy in the true sense of the word. For if, by such strained economy, the cows are let down into leanness, extra food is required to bring them up again into condition for calving and for subsequent milking. Apart from the question of waste in losing condition, it should be borne in mind that domesticated animals suffer pain and discomfort when exposed to the elements too late in the year.

Two years ago I wrote in the *Live Stock Journal* as follows : —“In the old days, which some of us look back upon at times with a feeling of regret, the treatment accorded to dairy cows, and to young and barren stock as well, left as a rule a good deal to be desired. This, indeed, is still the case in many instances, but as a rule a great improvement has taken place. Speaking of the times that are gone, I may remark that, on the approach of winter, when the cheese-making season was practically over, it was not considered worth while to pay any special attention to cows whose milk was rapidly diminishing in quantity. Most of them were in-calf for March and April, and the first two months of winter were considered the time for consuming inferior forage. The cows were no longer yielding a profit, and therefore they would do with

almost anything, so long as they could fill their poor starved bellies. A bellyful was a bellyful, were it only straw or fusty hay. People did not seem to consider that even if cows were giving no milk of consequence, the calf in the womb was making a constantly increasing demand on the system of the cow, and the season of the year demanded, too commonly in vain, a greater supply of heat-giving food to maintain the temperature of the animal. Indeed, not only was such food denied, but the shelter and warmth and comfort, which are to some extent its equivalent, were denied as well. Cows were kept out of doors far too long, pining under the lees of the fences, their wet skins causing valuable heat to evaporate from the system. The patient ass was often talked about, but the patient cow might well have been quite as often a theme for sympathetic conversation.

"I have often expressed myself in disapproval of the custom, still too much honoured in the observance, of keeping in-calf cows out on the pastures in the bleak days and chilly nights of October and November, and even of December in many cases. Apart from the cruelty of the practice, there is no real economy in it. That a storm of frost and snow should be regarded as a necessary signal that cattle should be housed, I have never yet been inclined to admit. Indeed, the housing of cattle in good time in the fall, is mere elementary wisdom and kindness in the treatment of animals so ill provided as cows are by natural covering to withstand the cruel blasts of a northern climate. If they lie warm and dry o' nights the benefit is considerable, even if they receive but little food "in-doors." Shelter and comfort, which of course mean warmth, stand in the place of so much food, because a large portion of what all animals eat is used to maintain bodily temperature. If farmers would always bear this in mind, they would see that no economy is to be found in keeping cattle out too long in early winter.

"But shelter in good time is not all I have advocated, and still do advocate. I plead for better food, and more of it in early winter, in the dead time of the year, when Nature herself

does so little for her creatures. As I have said, a great improvement has of late years taken place in the feeding and management of cattle in many parts of the country; but there are many parts still left into which such improvement has not penetrated very generally, and here it is that I wish to make myself heard. It is far better, too, to begin early than late with a supply of better food. A given quantity of corn fed to a cow during the whole of the winter, instead of being crowded into one half of it, will be found the preferable plan. For instance 2 lbs. of cake per diem from the end of September to the end of April will have a better effect than 4 lbs. a day during half the time. At least, such is my experience. And, indeed, to postpone the cake until the winter is half over is to allow the cattle to become lean first of all, and then to try to make them fresh again; that is, to get back somehow the condition which has been thrown away before. I wish every dairy farmer would try the plan of giving 2 lbs. of cake over and above their other usual food, with a few of his cows, just as an experiment. Let him begin early enough, say as soon as the nights become cold, and keep on steadily until grass day the following spring. Let him note the results, not only in the cows' condition, but in the quantity and quality of the milk they will yield. Let him compare these cows with others to whom these 2 lbs. of cake have not been allowed, and I believe he will admit that the cake has been a good investment. Begin early enough with it: better a month too early than a week too late."

Leaving aside for the moment the question of cruelty to animals, it should be made known that, in bad weather, shelter stands for so much food. The temperature of the cow's body must be maintained, and this can only be done by means of the carbo-hydrates in the food she eats. The heat-producing elements of food—sugar, starch, fat, and so on—are consumed in her stomach to maintain her physical temperature, just as coal is burned in a stove to warm a room, save that the process in the one case is slower than in the other. And therefore it follows that when there is a loss of animal heat in bad weather, owing to exposure, extra food is needed to make up for it, or

else the cow soon becomes "lean" from the consumption of her own internal fat for warmth.

It will now be seen that in bitter and piercing weather, of which we generally have a good deal in the fall of the year, it is not only cruel but wasteful to refuse the shelter which cattle require. Everything—fat, flesh, milk, bone—comes from food, and about two-thirds of what cows eat goes to supply the demands of the system before milk or flesh can be made from the rest of it. Indeed, the food supplies all—heat, motion, new tissue for what is constantly being wasted, and so on—and as something must be given for everything, it is impossible to produce anything from nothing. Therefore it follows that true economy, in reference to the food of cattle, consists in no slight degree in affording the shelter which is required in bad weather.

General Treatment.

We may say, then, that if cows are exposed to bad weather of any sort, particularly to cold combined with damp, a waste of food is invariably involved; so also if they are chased about by dogs, or flies, or men, or if they have to travel too far in search of food and drink—all is done at the cost of food; for the consumption of carbon is excessive in these cases, and the cow will lose flesh and give less milk, the quality of which will be reduced, if she is not treated upon what are called humanitarian principles. A cow that is starved of food, or "deformed by dripping rains and withered by a frost," cannot be said to have even common fair-play, and can do but little credit to herself in the way of yielding a profit to her owner. Instances may easily be found, in almost any district, showing the effects of feeding and treatment of dairy cows. In one instance we may see a prosperous man who, in feeding his cattle well, enriches his land; the land responds to this, and in turn feeds his cattle more liberally, maintaining a larger number of them than it would at first. In another we find lean cattle and impoverished land, which lead in the end to poverty.

I knew a man once who was notorious for starving his cattle and neglecting his land, though he was the owner of both. If he ever bought corn for the cattle or fertilisers for the land, he did so by stealth, for nobody heard of it. His cattle were so lean and weak in the winter that they could hardly get up without help, and sometimes couldn't with it ; his land got no help, and it starved his cattle in summer ; his meadows threw up a scanty crop that was deficient in nutriment, and so forth. Well, this man never prospered, never flourished, and he died as he had lived, in something very like poverty, which might just as well have been turned into plenty.

Lastly, there is the question of gentleness and kindness in the treatment of cows. There are, indeed, few cows who are not susceptible to treatment of this sort : they become gentler themselves in response to it, and yield more milk. Cottagers' cows generally do better for their owners because they are commonly tended by women, and women, as a rule, are gentler and kinder than men. A man who kissed his cow has been often cited, and the Austrian hussar kisses his horse ! These kisses matter but little in themselves, but they are outward and visible signs of inward and spiritual kindness and gentleness : these it is that are so beneficent in the treatment of cattle.

CHAPTER IV.

SUMMER AND WINTER FEEDING OF DAIRY CATTLE.

Grazing at Large.—Abundant Grass.—Crops and Pasture.—Condition of Land.—Wintering.—An Important Point.—Indoor Feeding.—Influence of Food on Milk.

Grazing at Large.

THE almost universal practice of feeding dairy cattle in England, and, indeed, throughout the British Islands, save in the Island of Jersey, and elsewhere to a slight extent, is to let them roam at large, from May to October inclusive, on the permanent pasture land of the farms. There is a good deal to be said in favour of the practice, and it has borne the test of centuries. When the cattle pick up their food from the soil on which it grows, instead of having it brought to them in the shippens, they do themselves the great bulk of the work which is necessary to their existence throughout that period of the year.

And, again, there can be no doubt that they are healthier and happier out of doors than in the sheds, when the weather is fine and flies are not troublesome. Indeed, it is seldom that they suffer much from the heat of the sun in a British summer, and we may take it for granted that the inconvenience of being constantly tied by the neck, constantly under a roof, would be a greater trial to them than the heat of the sun outside, during the very few days in the year when, in the British Islands, its rays are unpleasantly powerful. Moreover, in very hot weather, whenever it may occur, it is a simple matter to put them in the sheds for a siesta during a few hours in the middle of the day.

This, indeed, has much to recommend it, and is done by farmers here and there. In hotter countries than ours it is done pretty generally.

Whenever storms of wind and rain occur, the same practice may with advantage be adopted for the time being. In the late autumn and early winter months especially such storms are of common occurrence, and they come at other times as well. Shelter at these times is not only humane but judicious : humane, because the cows are saved from suffering ; judicious, because they make a return for it in undiminished usefulness. But it only too commonly occurs that the much-neglected cow has to gnaw up the last vestiges of pasture-grass and to lie on the sodden soil when she ought to be—at all events in the night-time—in a dry shippin and properly cared for.

That the fleshy condition of cows should be kept up in the autumn everybody will admit, and yet almost everybody neglects it. If a cow enters the winter in low condition and at a time when a six months' calf is being nourished in her womb, she will probably remain in the same state until summer comes again. How can such a cow be expected to milk well after her calf is born ?

There can be no wisdom, no saving, no common mercy in starving cows in the fall ; and, to avoid starving them, a plentiful supply of autumn food must be provided. Indeed, the danger of starving cows in the fall appertains only to the ordinary British system of depasturing them through the season ; it could hardly occur on the arable and soiling system at all, for in this case the animals would at all events always lie warm and dry.

The loss arising from a scanty supply of grass on the pastures, which compels cows to walk further and work harder in order to supply their need, is greater than most people think ; and no one has at present, so far as I am aware, given more than an approximate estimate of it, if even that. In a previous chapter I have said that some two-thirds of what a cow eats goes to maintain the temperature of the body, to repair the waste of bodily tissue, and to sustain the functions of the system. This

proportion is no doubt reduced when all feeding is done in the sheds, and it is increased when the cows have to travel far in search of food, or to graze industriously twice as long as they ought to do.

"A farm had better be over-rented than over-stocked" is an old maxim whose practical philosophy is perfectly sound, no doubt. And again, "Good land can hardly be over-rented, and bad land is seldom cheap enough." These are sayings of those who are gone, but they ought to be treasured in the mind of every farmer. They point, both of them, to the same truth—viz., that in order to thrive well or milk copiously cattle must have sufficient food of good quality, without having to be at too much labour in procuring it. This is well known to the grazier, for his cattle fatten slowly, or not at all, if their food is deficient either in quantity or quality. But it is not quite so obvious to the dairy farmer, unless he takes careful notice of the quantity of milk his cows yield and the weight of butter or cheese which he makes. The food requirements of cows in milk and in calf are necessarily much greater than those of fattening animals; for in addition to the production of a large quantity of milk, the offspring, in a foetal state in the womb, has to be supplied with bone and tissue. It is obvious, therefore, that dairy cows need generous feeding in order to yield a maximum profit.

Abundant Grass.

In the summer grazing of dairy cows, a sufficient supply of grass is, or ought to be, a *sine quâ non*. The maximum number of cows a given farm will carry successfully through the summer, on grass alone, can only be ascertained by an experience extending through several seasons, and to be exact is hardly possible in reference to any particular season beforehand. Better have one short of the number than one over it, and, if a grassy season comes, shut up a small field and mow it for hay. In any given pasture there is so much potential milk in a specified year, and if ten cows can take it out, a dozen will do no more;

may, a dozen will do less, for there are twelve cows' carcasses to maintain instead of ten. But if any dairy farmer prefers to stock his pasture land to its full capacity, and run the risk of a non-grassy season, he will see the wisdom of providing a succession of green crops for "soiling" in the summer and autumn months. If it so happen that the cows can do without this supplementary food, it may be made into hay or silage.

The general green crop for early spring use is a mixture of winter rye or oats and winter vetches, sown in September; for early summer use, ordinary rye or oats and vetches, sown as early as possible in the spring, on well-tilled and well-manured land; for late summer use, the same kind of crop, sown later, and at successive periods of two or three weeks; and for autumn use, late oats and vetches, and also cabbages and turnips to supplement the aftermath of the meadows. On warm and good land I fancy that green maize would provide excellent food for soiling, in suitable places, and in a hot summer it would perhaps grow into a heavier crop than any other forage plant.

Crops and Pasture.

In cases where arable dairy farming is followed in a plenary sense, there is of course no pasture land at all, save perhaps a paddock in which the cows can take their exercise once or twice a day. But it does not follow that there should be no permanent meadow land; on the contrary, it would seem desirable that there should be about as many acres of meadow land as there are cows in milk. This meadow land would grow a crop of hay that would form the basis of the entire winter's food for all the live stock, and the aftermath would be extremely useful in the autumn. In this way, indeed, the cows would have a chance of grazing out in the open fields during two months in the fall of the year, and it would be a good preparation for the coming winter. This, however, would not be arable dairying in the plenary sense, as it is practised in Denmark, or in France.

Where the whole of a dairy farm is under arable cultiva,

tion, a given proportion of it must needs be under clover and rye-grass and other temporary forage crops, to be cut for hay, and partly, perhaps, for silage, for use in the winter. Under all circumstances the winter—when all vegetation is in a condition of hybernation, so to speak—must be provided for. Subject to this imperative provision, the whole of the farm must needs be apportioned out for green, white, root, and temporary forage crops; the first—and in part the last—for summer requirements; and the second, third, and—in part—the last, for the inexorable demands of winter. Now all this requires careful management, accurate foresight, and a soil that admits of being cleaned and cultivated, not only in ordinary and average seasons, but in seasons in which clay-land cultivation is next to impossible.

Under this system the habits of the cows with regard to food are wholly artificial, and this cannot fail to have its effect on their health and vigour of constitution, as well as on those of their offspring. The natural food of cattle is grass, when they can have it, and “fog” in winter. They have grass throughout the six months beginning with May and ending with October, as a general thing, in the British Islands. Therefore for half the year they are existing under perfectly natural conditions—much, no doubt, to their comfort and advantage. But in winter they have natural food artificially preserved and prepared, and so-called “artificial food” as well. In summer the natural food, grass, is about as ideally perfect as anything they can have, if it grows on good sound land; but even grass may be profitably supplemented by corn within limits which are not very wide.

On some sorts of land—“scouring land” that rests on shale or on any other sub-soil—it may be regarded as good practice to give the cows a few pounds each per day of undecorticated cotton-cake: the shells of the seed, which all remain in the cake, possess an astringent property which helps to correct the aperient property of the grass. But even where this is not the case, a couple of pounds of bean or pea meal, or of crushed oats, or ground maize, in chaff, may be found to result in profit,

especially when the grass is deficient in quantity. The cows will give more and better milk, and maintain themselves in better condition, if they have these supplemental rations.

An early pasture is always welcome, after six months of winter, be it a natural or an artificial pasture. The earliest pastures are always found on the best land, or on land in the best condition, other things being equal, such as altitude or sheltered position. The grass and hay yielded by such land are superior in quality as well as in quantity to those from inferior soils. Hay from well-farmed land is superior to that from land that is out of condition, to a degree that would surprise people who have not put it to the test. Such hay, cut so soon as the grass has arrived at full growth, and before it is ripe, is corn and hay combined when compared with the wiry, innutritious stuff that grows on poor land.

The forwardest spring I have known, or at all events remember, was in 1889, and grass grew at a great rate on meadows and pastures alike. My own hay was gathered in by Midsummer Day, though we usually do not expect to begin cutting before the first week of July. This abnormally early grass requires more making into hay than that which grows slower and later; but, if it be well made, it is markedly superior to ordinary hay. And when the meadows are early, so are the pastures, that are so welcome alike to the farmer and his cattle. On farms that are partly arable, the earliest pasture is the land "seeded down" the year before, if it is not wanted for mowing.

Condition of Land.

Land out of condition—wet, sour, or poverty-stricken—produces grass that cattle do not like, and on which they cannot thrive or yield milk as they ought to be enabled to do, and as they would do on good land. Such grass is not attractive to them, and they devour it under compulsion, and sometimes under protest. This protest is to bawl for better grass, or to break through the fence in search of it. No land can be well farmed if it is wet; and the first act of husbandry on such land

is to drain it. But when drained it wants improving: the aqueous grasses which grew before must die out, and be supplanted by others which are suitable to the altered physical condition of the soil.

To promote the growth of these better grasses, a dressing of 5 or 6 cwt. of superphosphate of lime is to be recommended. Such a dressing, indeed, will often cause a transformation scene to occur in the character of the herbage, rendering it sweet where it was sour before, filling it with white clover where none was previously seen, and making it attractive where erst it was repellent. The coarse, sour grasses die out, the rushes and sedges vanish, and the new herbage consists of a variety of gramineous and leguminous plants, all of them nutritious, and sweet to the taste of the cows. They will eat off such herbage as bare as a lawn; and they always do best on food which they like. Those only are profitable pastures which cattle eat up with a relish.

Land in good condition has longer seasons than poor land: the grass upon it grows earlier, and later too, in the season. It is not easy to keep the grass from running ahead of the stock which the farm is calculated to carry in summer and autumn alike; but if it does run ahead, there will be plenty of meat for the autumn. The difficulty is to keep the grass under, during the period of most vigorous growth, in May and June, in order to prevent rankness and coarseness, and the only thing to do is to turn out early enough upon it. But with poor land the thing is to turn out upon it late enough, and to give it a good start, or else it will be bare all the summer. In a very grassy season, when the cattle cannot keep the pastures at all reasonably down, a field or two may be shut up for mowing; in this way the store of hay is increased, and a light dressing of superphosphate in the following spring will recompense the soil for the crop mown off it.

Young grass is always more easy of digestion than old grass, and much more easy than hay. And when the summer mellows into autumn the grass of the pastures begins to diminish in

succulence and nutritive value, whilst the proportion of its indigestible fibre increases. After a time it ceases to grow at all, and the sap in it goes down to the roots. To make up for this decadence, other supplies of food for cows are needed: these supplies are provided by "eddish" on the meadows, and by green crops on the arable land—cabbages, autumn vetches, second cut of red clover, turnips, and so on.

The leaves and stalks of the maize plant, cut whilst green and full of sap, are in America an excellent soiling crop, not in autumn only, but in summer too, when the drought burns up the pastures. Plots of this maize are sown in succession, and cut in the same order as required. The seed is sown much more thickly in the soil than when a crop of grain is wanted, and as the plants grow up to four, or five, or even six feet in height, the weight of green food per acre is very considerable. It would seem that maize might be widely grown in this country as a green crop for soiling purposes. In default of green crops in the autumn, and when the eddish is finished, 3 or 4 lbs. of cake are found most beneficial in maintaining the flow of milk and the condition of the cows. If the autumn be wet, which is commonly the case, the rough cotton-cake will probably answer best of all, either with green crops or without them.

Wintering.

Assuming that cows have been well attended to in the fall, and come into winter quarters in good store condition, the difficulty of wintering them nicely is diminished. Those of them that are "on note" for early February must be let dry for calving about the end of November or in the early part of the following month; and as soon as the milk has gone they should be generously fed as a preparation for the next season's milking.

As a general rule, cows should be "dry" about two months. Some of them, however, are let dry with no little difficulty for a single month or less, and here and there one resolutely declines to be let dry at all. I know of nothing better,

cheaper, and simpler than two meals of hay and two of good oat straw, along with 4 or 5 lbs. of linseed cake per day; or the cake may just as well be half linseed and half decorticated cotton-seed; or, indeed, and even preferably, it may all be decorticated cotton-cake. The cake will cost about 4d. per cow, per day; and beside saving its cost in hay and greatly improving the manure heap, will leave the cows in better condition than hay could possibly do, and also enable them to calve with less straining and exhaustion. When cows are dry for calving they commonly have to consume oat straw as the chief food, but oat straw is sorry food alone, when all the oats have been threshed out of it.

A good deal has been written in recent years about rations for cows in milk, and Professor Stewart, of America, recommends the following, per day:—

	Albumi- noids. lbs.	Carbo- hydrates. lbs.	Fat. lbs.
12 lbs. of good meadow hay. . . .	0·65	4·92	0·12
3 lbs. of maize meal	0·25	1·81	0·14
3 lbs. of ground oats	0·27	1·30	0·14
3 lbs. of wheat shorts	0·27	1·64	0·08
4 lbs. of linseed meal	1·10	1·32	0·28
	<hr/> 2·54	<hr/> 10·99	<hr/> 0·76

These percentages of nutrients represent that fat should be about one-third the weight of the albuminoids, and the albuminoids about one-fourth the weight of the carbo-hydrates, which last consist of sugar, starch, gum, &c.; and in the above formula the three groups of nutrients are, chemically speaking, believed to be in well-balanced proportion, which reduces the waste in digestion to a minimum.

An Important Point.

It will be noticed in the foregoing table that the carbo-hydrates and fat, the heat-producing elements of food, are in very considerable proportion, and that the flesh-formers—the albuminoids—are not. It will therefore be understood that the

heat of the body is an all-important demand of nature, and that it is a serious matter to expose cattle to climatic conditions which reduce warmth to any considerable extent. On this account it is not a good thing to allow cows to drink large quantities of water which is only just above freezing-point—32° Fahr.—or to eat a lot of ice-cold turnips. Before the water or turnips can be assimilated by the organs of digestion, their temperature in the stomach has to be raised to 98° Fahr., which is the normal temperature of the cow's body, and this involves a waste of carbo-hydrates, which may be avoided in respect to the water by warming it artificially; and in respect of the turnips, by pulping them and mixing them with chaffed hay and straw, when, after a few hours, the temperature will be raised by fermentation. This fermentation has the useful effect of rendering the chaff easily digestible. The value of giving cows warmed water to drink in winter—warmed say to about 75°—has been repeatedly proved; and cows will give more and better milk, on a given quantity and quality of food, than when they drink cold water. Mr. Gilbert Murray, who for years has devoted a good deal of attention to dairy subjects, gives the following as an average daily ration of food for a cow in full milk in winter:—

	lbs.
A mixture of chaffed hay and straw	20
Bran meal	2
Ground oats	2
A mixture of wheat and barley meal	2
Linseed meal or cake	2
Bran	2
Roots	25
Hay, divided into two feeds	5
	<hr/> 60

Indoor Feeding.

The roots in this ration, or at all events the greater portion of them, would be pulped and mixed with the chaffed hay and straw, and the different kinds of meal added just before feeding-time. Two feeds of hay per day are advisable, in order to

promote rumination, and it would seem as if 5 lbs. were little enough for the purpose. The ration, however, is only approximate as to weight, for while some cows will need more, others will need less. No hard-and-fast line as to quantity of food can be laid down, though as to quality it almost may. The way to feed most cows properly is to give them as much as they will eat up cleanly and with a relish; each cow's capacity for food should be carefully watched by the cowman, and while fastidious animals may be tempted by a better quality of food, a gluttonous cow should be regularly restricted to a reasonable quantity. There are gluttonous cows as there are gluttonous animals of other kinds, and it is safe enough to say that they consume a good deal of food to waste. A morbid appetite must therefore be placed under restraint.

Where silage is used it may well be chaffed along with hay or straw, and in this way form a substitute for roots. Some farmers pour well-boiled linseed amongst chaffed hay or straw and others use cheap treacle in the same way; either of them is good in its way, but the cost should be calculated. Some high authorities do not like to give cooked or steamed food to cows, save perhaps for a few weeks after calving; largely fed on cooked food in winter, cows will not do so well on grass in summer, because their digestion has been weakened. To steam mouldy hay, however, is a good thing, in order to destroy the fungus; but mouldy hay should not be fed, steamed or not, to cows in milk. The object of slow fermentation in chaff is to make it more easy of digestion, and this no doubt is an economic gain of some considerable importance.

Influence of Food on Milk.

In respect of the influence of food on the milk yield of cows, the following theses may be considered to be well established:—The quantity and quality of a cow's milk is a question depending more on breed than on food. An increase of food, sustained both as to quantity and quality, increases the yield of milk and to some small extent the proportion of solids in it; but

an increase of fat in the food bears no special relation to the proportion of fat in the milk, though it will almost always increase the yield; fat, indeed, is needed in the food to keep up the heat of the cow's body, and will to a considerable extent be used for this end; but an increase of albuminoids in the food finds a more ready response in the quantity and quality of the milk. The component elements of the solids in milk are not generally and materially affected by changes in the composition of the food, but to this rule some cows afford striking exceptions. There is a natural limit to all cows' capacity for yielding milk, and when a cow is fed up to this limit increased or improved food cannot extend it. It follows, therefore, that while a superior cow is seldom fed up to the limit, an inferior cow may easily be fed beyond it.

The practical inferences from these experimental data are that the idiosyncrasies of each cow should be studied and met, and that scientific feeding, while valuable as a guide and as a study, is sometimes followed by results so disparate and varying that no absolute rule can be laid down to suit all cases. In the case of a boiler, the quantity of coal and water required to produce a given volume of steam may be calculated to a nicety; but there is no such correspondence—applicable to cows generally—between what a cow eats and the milk she will yield or the flesh she will elaborate. The feeding of cows, therefore, is an art, but not a science. So, indeed, is agriculture in most of its bearings.

The careful cow-keeper will see that his cattle are fed with "just enough and none to spare." The art of economical feeding, so far as quantity is concerned, lies in knowing how to make the cattle eat all up cleanly and with a relish. Over-fed cattle seldom thrive as well as those which have just what they need and no more. A wise farmer I once knew said, "Better keep your cows just a little 'on the snap' than over-feed them."

CHAPTER V.

CROPS ON DAIRY FARMS.

Restrictions on Cropping.—“Arable Dairy Farming.”—Grand Old Pastures.—Thin, Light Land.—Arable Crops and Grass.—When to Mow.—Drying Hay in the Rick.—Silage.—Economical Feeding Stuffs.—Green Food.

Restrictions on Cropping.

IN the sixties and seventies it was a common practice for landlords or their agents to place restrictions of a stringent character on the cropping of land. Under yearly tenancies the course of cropping was strictly defined in “agreements,” or else limits were laid down, beyond which the farmer was not allowed to go, in reference to varying the system of crop-rotation that was general on the estate, or in the county. But this irksome system of tutelage has been greatly relaxed since 1880, partly on account of the Agricultural Holdings Act of 1883, but chiefly because of the severe depression which has afflicted agriculture during the past ten or twelve years. The time, indeed, has gone by when farmers might be called upon to submit to hard-and-fast lines of cropping their land; and now, as a rule, they are at liberty to raise such crops as they deem best for their purpose, and in the manner which seems the most convenient and suitable. The result is that cropping-rotations are more varied than was formerly the case, and such crops are raised each year as are likely to be most wanted. The restrictions of old times seem already to have become archaic; it is indeed a matter for surprise that they should ever have existed; and farmers of the twentieth century will with difficulty believe

they ever did or could exist. The employment of purchased manures and feeding stuffs has long been regarded as a necessity by all progressive farmers. In this way have such farmers been constantly adding to the fertility of their farms, and, in these cases, restrictions as to cropping became a glaring absurdity which could not be sustained. The time is probably coming pretty soon when foreign feeding stuffs will not be available at easy prices, and further modifications in cropping will then be carried out.

"Arable Dairy Farming."

The system known as "arable dairy farming" has not in this country attained the degree of popularity which it enjoys on the Continent, and is not likely to do so. The reason is chiefly a climatic one, perhaps; but at all events so it stands. My greatly valued friend, the late H. M. Jenkins, whose far too early death was a distinct misfortune to British agriculture, had a high opinion of arable dairy farming as he had seen it practised in France and Denmark, and he strongly urged it on the notice of farmers in this country. In his Report to the Royal Commission on Agriculture—a report of distinguished ability—he says on page 70:—"I have frequently pointed out that one of the principal lessons that in my judgment English farmers have to learn from their Continental brethren is the breeding and rearing of stock, and the making of butter and cheese on arable land. . . . In Denmark, as I have already reported, permanent grass is almost an unknown element on breeding and dairy farms."

When Mr. Jenkins presented his report, we had not then been suffering from low prices of farm produce long enough to feel convinced that expenses must be carefully and even rigidly cut down to enable farmers to "make ends meet and tie." The cost of cultivating arable land, particularly all stiff soils, is a serious matter; and while wheat was selling at 30s. a quarter, oats at 20s., and so on, in recent years, it was out of the question that arable cultivation should increase, even on dairy farms. It is undeniable that land

can be made to produce more food for stock when it is frequently under the plough than when it is under permanent grass. The one constant crop of grass cannot be made to equal in weight or value a variety of white crops, green crops, roots, rotation grasses, and so on. But it is questionable if the cost of growing the latter does not more than balance the extra value of them, save on the most friable and suitable soils.

The Dutch people are, to say the least, as plodding, and neat, and shrewd as those of any other country, the French and the Danes not excepted, and their dairy farming is to a great extent on permanent grass land. Arable dairy farming is for the most part a speciality of the Danes and the French, and the Dutch have not at present seen reason to copy it to any great extent. On heavy soils, indeed, it is hardly practicable, and wet climates are unfavourable to it; on the light, friable loams of France and Denmark the conditions are tolerably favourable, no doubt, and the French climate is more suitable than ours for continual arable cultivation.

Grand Old Pastures.

In a climate in which fine weather is almost comically uncertain, the difficulty of cultivating stiff and retentive arable soils is well known to farmers who have had it to contend with; and unless such land can be kept clear of weeds it is better laid down to permanent grass. But on the loose and friable soils that are naturally dry—the sandy, chalky, or limestone soils—the cost and difficulty alike of cultivation are very much less, and it is on these soils, if on any at all, that we may expect arable dairy farming to extend in this country.

The contraction of foreign competition—chiefly American—which we may reasonably expect to occur before this century closes, will give to arable cultivation in these islands an impetus which has long been wanting. In this event, arable dairy farming will no doubt become much less singular than it is at present. For the time being, however, the cost of

labour and of wear and tear, the low prices of farm products, the broken character of the seasons, the volume of foreign competition, and so on, will cause things to go on pretty much as they are.

The grand old pastures which are found in many parts of the British Islands, mostly in the valleys, or in the fen and fylde districts, though also on the rolling surface of some of the Midland counties, and here and there on elevated tablelands of limestone, the splendid grazing lands of Ireland, Scotland, Wales, and many counties in England—these, it is to be hoped, are safe against disturbance, though most of them have been under the plough in bygone centuries, in the far-off times of the past when England had a population of six or seven millions, and was a corn-exporting country. It has taken centuries to form these noble swards; to disturb them would be an act of sacrilege.

Thin, Light Land.

There are, however, large areas of land all about the country which no process of top-dressing and good management could ever make into good, permanent pasture or meadow. On the wolds of Yorkshire, the downs of Wiltshire, the sandy plains of Norfolk, and in many other counties such land is to be found. It is as a rule too thin, too light, too unretentive of moisture to make profitable grass land; and as it is easily cultivated in almost any sort of a season, it is best under the plough in rotation crops. It is on the better light and dry soils that arable dairy-farming may perhaps be found to pay as well as any other sort, if only fair green and root crops can be raised. A good deal of the lightest land, however, is fit only for sheep pasture and not worth cultivating at all.

Among the more desirable of dairy farms are those which have good land in the valleys for pasture and meadow, and lighter, less rich land elsewhere for tillage. The most desirable ones are those whose land is all good, and some of it dry and friable enough for easy cultivation. But arable dairy-farming, as it is practised in France or Denmark, will hardly become

general or even common in England. Few, if any, dairy farms in this country are likely to become wholly arable farms until such changes in prices have occurred as will make them profitable on the Continental system. On the other hand, it may freely be admitted that dairy farms wholly, or almost wholly, under permanent grass are not quite what dairy farms ought to be, though there are many such to be found. Arable crops of one sort and another are always desirable where cows in milk are kept, and, speaking generally, the greater variety of them there is, the better.

Arable Crops and Grass.

I will assume that we have a 200-acre farm of good land, 60 or 70 acres of which are usually under arable crops or temporary grass, and on which 50 to 60 dairy cows are kept, as well as the young stock incidental to them. On a farm of this kind there would be about 50 acres of meadow land and the rest in permanent pasture. This seems to be a nice apportionment of the land to pasture, meadow, and arable crops; and as the meadow land is a very important feature, I will begin with it.

That our meadows should be made to yield large crops of hay is, of course, a desirable thing, and a dairy farmer should, if possible, always have two or three old ricks to begin the winter with, and as a "nest-egg" against a season when the crops are lighter than usual. As a general thing it is desirable, but not always practicable, to manure meadows lightly all over once a year, for two light dressings are better than one heavy one—that is, a light dressing each year, rather than a heavy one each alternate year. The cattle will hardly make manure enough to give all the meadows a fair dressing once a year, but the remainder should have a dressing of artificial manure. During many years I used to dress my meadows in this way, using 1½ cwt. of nitrate of soda, 2 cwt. of mineral superphosphate, and 3 cwt. of kainit per acre, supplying in this way the nitrogen, phosphoric acid, and potash which plants require to promote their growth. This particular mixture of artificial manure is

most of all effective on a somewhat heavy and retentive loam, damp, but well under-drained.

Alternate annual dressings of natural and artificial manures are, I believe, much preferable to unvarying dressings of either one or the other. The more natural manure there is available, the less artificial will need to be bought, and as the land improves in condition—as improve it will under this treatment—the dressings may well be slightly lessened in quantity. Hay grown in this way, if well saved, is always of superior quality. It takes more drying for the rick than that from poor land. There is more strength and steam in it, and consequently it is better food for stock in winter. The difference, indeed, is far greater than a novice would think possible.

When to Mow.

Winter- and spring-saved meadows are fit for mowing early. No fixed date can be laid down, for the time of maturity varies. I knew an old-time farmer, long years ago, who invariably began mowing on Midsummer Day, unless it fell on a Sunday, whatever the weather and the state of his crops might be. The time to mow meadow grass is when the bulk of the crop is still a little unripe—that is, when the seed-stems are well in flower, and the pollen of the flowers is freely falling on our boots as we walk through the grass, or when a tinge of brown steals over the face of the field. It is a mistake with grass to let it stand until it is dead-ripe, for then the indigestible woody fibre has increased, and the sugar that was in the sap has gone. Doubtless there is more weight of hay if the grass is cut late, but the quality is greatly reduced. Cut early, and well harvested, hay from well-farmed land is hay and corn combined. When most of the heads of clover are in bloom, and the rye-grass is browning, is the time to cut a field of “seeds,” if only the weather be suitable.

Freshly-cut grass has an oily or waxy coating on the outside, which makes it waterproof for a time; but when it has been repeatedly stirred by the tedder, the stems are more

or less broken or bruised, the cell-walls are crushed, and the sap begins to ooze out and escape, unless the drying proceeds rapidly and the sap is evaporated, sealing up within each stem and leaf of grass the valuable properties it contains; in wet weather this cannot be done, because there is no evaporation, no drying, and during such a time the grass should either not be cut, or not tedded if it is. To bruise the grass in wet weather is to let the sap out and let the rain in, and this soon will injure it alike in quality and condition. But, in fine weather, the grass cannot be stirred about too much; the object is to bring all of it under the influence of sun and wind, and to have it dry as early as possible.

Drying Hay in the Rick.

There is a curious difference in land with reference to the amount of drying which hay requires, and the cause of it is not fully understood. On the limestone soils of Derbyshire it is necessary to dry the hay thoroughly, or it will ferment in the rick to a degree that will greatly injure it, or even expose it to the risk of spontaneous combustion; a general custom is to put it into "quiles" of about a ton each, in the field, in order that it may have a preliminary "sweat" in small bulk. On the clay and freestone soils of Staffordshire no such precautions are necessary, and the hay may be ricked in a condition which Derbyshire men think very dangerous. A two-inch galvanised-iron pipe, perforated with quarter-inch holes pretty numerous, and long enough to reach from the bottom to the top of the rick, will provide a chimney up the middle through which the steam of fermenting hay may escape; this simple, self-acting contrivance will cool a rick most excellently. However, in good weather, hay can be made anywhere; it is the uncertainty of the climate that is the bane of our haymaking, and this is the reason why, in the various wet summers we have had in recent times, so much attention has been turned toward ensilage as a system calculated to make us independent of the weather.

Silage.

Opinions vary a good deal as to the value of silage, but the majority are in favour of well-made hay. Mr. Gibbs, of Gilwell Park, spent a fortune in devising a machine for making hay by artificial heat; thousands of pounds have been thrown away in experimenting with "exhaust-fans" for finishing haymaking in the rick, whereas a perforated pipe or two would do the work better automatically, and at a mere fraction of the cost; and, lastly, the system of ensilage has taken a considerable hold on the public fancy; the hay-dryer and the fans are now obsolete, but ensilage will probably survive some time longer as a system of preserving grass and other forage crops for use in winter. There can be no dispute that the easy digestibility of silage is a merit which hay does not possess in the same degree, for silage is damp and soft, while hay is dry and hard. But silage is frequently a failure, and even when it is not there is usually a good deal of waste all round the outside of the silo or the silage-rick.

Years ago there were several enthusiasts who did harm to the reputation of silage by claiming for it several merits which could not be sustained in practice, and were not corroborated by science. It was claimed, for instance, that even good meadow grass, or clover, or any other excellent forage crop, was improved in quality and increased in nutritive value by being converted into silage; that various plants which are properly regarded as weeds—spurrey, for example—and rough grass from roadsides or plantations, become good food in the form of silage; and that almost any kind of green stuff that stock will hardly touch was converted in the silo, as if by magic, into palatable and nutritious food for winter use. Now it is certain that no change within itself can improve good grass or clover, or any other forage plant; but that, on the other hand, the rapid fermentation which is unavoidable in the silo is a chemical process which injures the silage as food, chiefly by converting the sugar into acids. By allowing the temperature of the silage to rise to 130° Fahr., it is said that the bacteria which pro-

duce acid fermentation are destroyed, and sweet silage is the result ; but this requires nice judgment and most careful superintendence.

Supposing, however, that every farmer will bestow the necessary care in making silage, the stuff must needs be given sparingly to cows in milk, or the milk may easily become tainted. One of the largest milk firms in this country will not buy milk from farmers who use silage at all. Various crops may be converted into silage, and in wet seasons it is no doubt an advantage to avoid spoiling good grass by trying to make hay of it. But on the other hand it may be pretty safely predicted that a few fine summers would leave a great many silos empty. After all, however, in any sort of a season, silage may be said to be a very tolerable substitute for roots, if not for hay.

Economical Feeding Stuff.

Silage ricks are found to answer tolerably well, yet there is more waste of silage in them than in silos. But they obviate the necessity of going to the expense of building a silo, and are consequently coming more or less into favour amongst farmers who are at all inclined to make silage. It may be taken for granted that nineteen out of twenty farmers who are in the habit of making silage at all, would prefer to make good hay if the weather were suitable ; in these instances, therefore, it is probable that silage ricks will be more popular than silos, if only for the reason that they can be made or not, at will, according to the state of the weather. I have known shrewd and experimenting farmers try silage for a year or two, or for several years, and then drop it again. Others there are, no doubt, who persevere with it, and believe it to be an excellent thing. It will live or die on its merits, and a few more years will probably determine its fate, as a feature, permanent or otherwise, in the agriculture of this country.

Wherever there is a good stretch of arable land on a dairy farm we may expect to find, as a rule, oats as the principal if not the only white crop ; because oat straw makes better winter

food than the straw of either wheat, barley, or rye, and the oats themselves form a valuable item in the list of corn consumed on the holding. The consumption of home-grown corn on a farm deserves encouragement by being admitted for compensation on the same basis as purchased corn. Why not, indeed? A farmer now may sell his home-grown grain, buy other corn or cake with the money, and be entitled to compensation for what he buys if he leaves his farm; why, therefore, not encourage the consumption of home-grown grain by serving all alike?

Oat straw, and wheat straw too, for the matter of that, may be greatly improved as food for stock by being chaffed along with about 5 per cent. of green and succulent tares or rye, and well trodden down in a bin or silo, a bushel of salt being scattered amongst each ton of chaff. Straw-chaff treated in this way and left for six months has undergone a slight and slow fermentation which has made it compare very favourably with unprepared straw. The late Dr. Vöelcker found it contained two and a half times the percentage of sugar, gum, &c., and was one-fourth richer in materials which produce the lean fibre of meat or of muscle; the percentage of soluble vegetable fibre was nearly twice as great, and the fermentation rendered the hard, dry substance of the straw more easily soluble and digestible than it would otherwise have been; the prepared straw-chaff had the agreeable smell of good green meadow hay, and an infusion of it yielded a liquid hardly distinguishable from "hay tea." Two hundredweight of decorticated cotton-seed meal added to a ton of the chaff raised it to the quality of good meadow hay.

In order to treat straw in this way the farmer must needs have part of a winter's supply beforehand, and chaff it in the spring or summer. The advantage of having a lot of prepared chaff of this sort will be obvious to those who are in the habit of pulping roots and mixing the pulp with chaff.

Unprepared oat straw has been found to be much more relished by stock if it were well wetted with water and left to soak for twenty-four hours. The softening renders it easier to

masticate and to digest. And herein a great gain is to be found—a saving of labour and of food, a lessened expenditure of force.

Green Food.

Many farmers take care to have some early green food for cattle in the early spring—that is, in the latter part of April, or the first week of May—winter tares and rye answering the purpose as well as anything else, as arable crops; *trifolium incarnatum*, a valuable member of the clover family, and sainfoin are grown in the southern counties as early green food for stock. On the carboniferous limestone soil of north Derbyshire, my father's cows used to get an early and excellent bite of green food in the budding spring on land seeded down the previous year; many men, however, prefer to mow the "seeds" for hay, in which event the cows have to wait until there is grass for them on the permanent pastures. Much depends on the soil, whether it be sound; and on the climate, if it be genial. By liberal and judicious top-dressing of winter-saved pastures—top-dressing in the autumn—it is possible to have ordinary pasture grass almost as early as "seeds."

The object of green crops on arable land is primarily to shorten winter at both ends, but the practice in arable dairy farming may be extended until it includes, by successive crops, the whole of the spring, summer, and autumn. For the winter, roots and white crops are raised on arable land, and in some cases green crops for silage. For autumn use, cabbages form a valuable food for dairy cows, and the tops of turnips and mangolds fill up a gap. Common turnips are useful for early winter, swedes next, and mangolds keep well into spring. As I have said, the object of arable dairy farming is to make the land carry more stock and produce more milk. This is no doubt the result, but the system requires an extra outlay in men, horses, implements, and manure, and the question for each farmer to ask himself is this: Does the arable system yield enough to pay the extra cost and leave a profit?

CHAPTER VI.

A FARM IN THE PEAK OF DERBYSHIRE.

The Peak Country.—Low Fields Farm.—A Pastoral Drama.—A Valuable Discovery in Cheesemaking.—Acid Curd.—A True Farmer's Wife.—“Come, Lads,” not “Go, Lads.”

THE soil of “the Peak country” lies mainly on the carboniferous limestone, and consists of valleys wide and valleys narrow, lofty tablelands, and great rolling hills. Commonly, though not generally, the valleys are well timbered and picturesque, but the hills and tablelands are for the most part bare and bleak, and fenced with stone walls. Some of the valleys are steep and narrow, whilst others are spacious and picturesque.

It is in one of the latter, in the southern end of the Peak country, and some half-dozen miles south-west from the pleasant little market town of Bakewell, which is famous on account of the puddings that bear its name, that the homestead of Low Fields Farm is situated. The farm consists of some 330 acres, and stretches away two miles up to “the Moor,” where more than half of it lies. It is in a sense two farms in one, the lower half a dairy farm, pure and simple, and the upper half a sheep or a mixed farm. Around the homestead in the valley the land is naturally fertile, but the moorland is “thin-skinned” and not very fertile by nature, though withal it is sound and healthful. Somewhere about a century ago it was fenced in and cultivated, and a big set of buildings was put up to accommodate live stock in winter time. A house for a labourer adjoins the buildings; but the loneliness of the spot in the dead time of the year, with only one solitary house in sight of it, was more than any labourer could stand very long.

The farm was taken in hand more than half-a-century ago by a young farmer of twenty-three, who a year or two afterwards married the daughter of a yeoman, just over the border in Staffordshire. At that time the land was in a "run-out" and forlorn condition, "hide-bound" with twitch grass and poverty; the walls were dilapidated, the buildings out of repair, and the house as old as it was inconvenient. In those days the farm carried some twenty-five dairy cows and seventy breeding ewes, with young stock in proportion, and four horses, and carried them indifferently well. This young couple, however, had youth, and health, and hope to encourage them—three excellent gifts in life—and they set to work with a will to improve the farm and make it pay. The moorland was the arable part of the farm, and it was repeatedly stimulated with applications of ground bones, three-quarters of a ton to the acre, until at length it yielded an abundance of grass, and excellent crops of oats and turnips—excellent, I mean, for such a soil and climate.

The oats sometimes yielded over 60 bushels, and the turnips over 40 tons, per acre. The soil was cleared of thousands of tons of rocks and stones which were in the way of the plough, and miles of walls were rebuilt, all at the cost of the tenant. After five-and-twenty years of toil and outlay the stock-carrying capacity of the farm was raised to 45 dairy cows and 150 breeding ewes. The cattle were Shorthorns; the horses, Shires; and the sheep, Leicesters.

It was a yearly tenancy, unfortunately, and the landlord encouraged the tenant in his outlay on improvements by a promise that the rent should not be raised whilst he, the landlord, lived. This landlord was W. P. Thornhill, formerly M.P. for the north of the county. For no reason that was ever made known, the landlord went behind his promise—a promise that was spontaneously made—and, "like a bolt out of the blue," a notice was sent by Taylor, the agent, meaning an increase of rent. This was a blow which shortened the days of the tenant. This episode is placed on record as an instance of the injustice in which landlords and agents could then indulge with impunity against a tenant who for more than thirty years had been

steadily and rapidly improving the farm. It was all the agent's doing, I believe.

The actors in this little drama in pastoral life have now all gone to "the bourne from whence no traveller returns," and the agitation created in the district at the time it occurred has settled down, like the ripples on water into which a stone has been thrown. I knew them well, all of them, for the tenant and his wife, who happily for herself passed away not long before the drama came, were my father and mother.

Six to eight tons of cheese each year were made, and for close on thirty years it was the wife who made it. The dairy-maid, in fact, was the farmer's wife, an arrangement which was formerly, and perhaps still is, considered indispensable to a good dairy of cheese. The cheese was made up fresh and sweet each day—that is, without any introduction of acidity—and was never a really first-class lot, though as carefully made as cheese could be. At length one day it happened that a few pounds of curd in a pan were mislaid and overlooked, and not put into the cheese of the day. After a debate between husband and wife as to what was the best to do, it was decided to put it into one of the morrow's cheeses, mark that cheese with a penny in the press, and await the result of the experiment. In course of time the cheese was cut and found to be excellent—that is, just about perfect! The curd that was kept had become sour by the morning, and this acidity was deemed to be the one thing needful to correct what was amiss with the cheese of that dairy.

From that time a portion of curd was always kept from one day to another, and mixed with the next day's cheese; the result was completely satisfactory—so much so, indeed, that one whole season's cheese, kept till Christmas had turned, made nearer ninety than eighty shillings per hundredweight!

Here, then, a valuable secret in the art of cheese-making was in this case accidentally discovered, and the "sweet curd" system was finally abandoned. Many years afterwards, when inspecting the methods of cheese-making in the Fylde of Lancashire, I found the sweet and acid curd systems side by side,

so to speak, in the same locality; in the latter case the cheese was very fine, but not so in the former, and I was able to give advice which, as I have since heard, put the former right. Modern research and experiment have abundantly demonstrated the fact that cheese requires acidity, in some way or other acquired, to enable it to ripen properly; failing this acidity, it is liable to swell and crack, and to behave in a generally discreditable manner. Such is the case more especially on highly-farmed land, from which the cheese is more liable—just as the hay is—to somewhat excessive fermentation.

On poor land unimproved the difficulty of making good cheese on the sweet-curd method is not by any means so great; and this it is, no doubt, that established the old-time dictum, viz., "It is the poorest land which yields the best cheese."

This in all probability was frequently the case in the olden times, when the why and wherefore of these things in cheese-making were not understood. The old way of cheese-making was completely unscientific—that is, it was not practice perfected as the result of careful and repeated experiments. There are still persons who say that the cheese of the last is inferior to that of the first decade of the nineteenth century; it may be so possibly, though it is to the last degree unlikely. In any case, we are destitute of all means of comparison; but if analogy will aid us, we may say that nowadays it is not the poorest land which produces the best cheese. I have reason to believe that the cheese made on the Low Fields farm in the early days of my father's tenancy was better than that made later on, until the time when the acid-curd secret was revealed. There was undoubtedly some coincidence between the improvement of the soil and the deterioration of the cheese, but this coincidence was more or less irregular. It stands to reason that where a soil has been greatly enriched an old-time method of cheese-making, that was suitable to its pristine condition, will not answer now.

I know well enough, for it is within my recollection, that the old method, which was hardly the same in any two places,

was frequently a failure, and nobody, to be sure, knew why. People were very much in the dark about it in those days, as indeed they were about many things else.

Farmers, and farmers' wives too, worked hard in those old days of forty years ago, quite as hard as they do now, I think. Early and late did she work—the wife of whom I am writing. Often have I known her to bake a huge pile of oatcakes before her maids were down in the morning, and the husband would fetch in the cows from the dew-laden fields for himself and his men to milk them. “*Come, lads,*” he used to say, not “*Go, lads,*” leading his men up to the moor as soon as breakfast was over. And he whistled like a lark as he went to the hills.

The ploughing was all on the moor, the seeding of oats and of turnips, and the weeding and harvesting of both. All the young cattle and the sheep were wintered up there, and the milch cows chiefly at home. It was a long, hilly, inconvenient farm, as many of the Peak farms are, and the work upon it, as well as the time lost in going to and fro, was proportionately increased. A large portion of the milking pastures was across a deep valley, and the cows had more heavy exercise to undergo than was good for them—so far, at all events, as their milk-yield was concerned.

The Peak of Derbyshire is a healthy country both for man and beast, but the winters are long and bitter as a rule. The soil, however, is sound for the most part, seldom wants draining, and responds quickly to liberal farming. The milk produced upon it has now a reputation in the great cities, as it also had in the old days for making cheese and butter that could be depended upon for quality, and to keep for a reasonable time. It is naturally drained by the fissured rock beneath, and sheep remain sound upon it in the wettest of seasons. The farmers are a careful, thrifty race, laying by “a nest-egg” whenever they can against the inevitable time of scarcity. Consequently they have weathered the storm of the last dozen years about as manfully as the men of any other district in the land.

CHAPTER VII.

THE DAIRY.

Milk and its Management.—Temperature and Milk.—Ventilation and Cleanliness.—Dairy Equipment.—Milk: its Composition.—Cream and Creamers.

Milk and its Management.

If any dairy farmer need it, let me persuade him to take notice, when his milk has stood at rest a day or two in the pans, if there is a sediment of dirt at the bottom of it; if he find it there, he will reasonably regard this dirt as "matter out of place," and will naturally inquire whence it came and why. If he take pains enough, he will find that it came off the cows' teats and udders, or the milkers' dirty hands, or a cow's foot that inadvertently found its way into the milking-pail. He will then arrive at the conclusion that there is carelessness among his people, and possibly even in himself. From this he will probably conclude that it is worth his while to see that udders, and teats, and hands, and milking-pails are clean, and that all restive cows' legs are tied, as a precaution, before those particular cows are milked.

But it is not only from dirt that milk receives pollution. Strong odours, nauseous or otherwise, which permeate the air are absorbed by milk that is exposed to them, but only when the milk is as cold or colder than the air. The question of temperature governs the absorbent capacity of milk; for so long as milk is warmer than the atmosphere that surrounds it,

the odours which it contains disperse into the air. Cold air coming in contact with the surface of warm milk expands, and therefore rises by virtue of its diminished gravity: its capacity for holding gases, vapours, odours in suspension, is increased, so that it takes up the volatile odours of the milk, and may even be made to purify it to some extent of its "cowey" smell, particularly when the milk is well stirred about for a time. All this needs only to be mentioned to enable dairymaids to recollect that it is so, and that the truth of it may be tested without much trouble by almost anybody.

In order to ascertain which cows, if any, are not worth keeping for milk, each one's milk should be weighed when it is taken. The *quantity* is quickly seen by using the spring balance shewn in Fig. 15, which is sold by The Dairy Supply Co., and called the "Sandringham Milk Recorder." The *quality* of each cow's milk can be ascertained by the apparatus seen in Fig. 24, page III.

Temperature and Milk.

But if cool milk be placed at rest in a warm room the air of which is not pure and fresh, the moisture which the air contains condenses on the surface of the milk, and with it the odour of the room is also deposited. Hence it follows that milk is not so easily contaminated in this way as might have been supposed, so long as it is warmer than the air which rests upon it. The odours of the shippin, the breath of the cows, the keen smell of silage, the sickening stench of a liquid manure tank, or of a piggery, are comparatively harmless so long as the milk remains warmer than the air in which these odours float. When milk is taken from the cows' udders it is at a temperature of 98° or less; and as the air is but seldom at that high temperature, even inside a cowshed in the heat of summer, the milk will take but little harm from the absorption of odours until its own temperature has fallen to that of the air. That this is so is very fortunate; otherwise milk would be commonly tainted during the process of milking. All the same, however, it should be taken at once to the cool retreat of the dairy, and

disposed of as may be required for either butter- or cheese-making.

While the air is seldom impure enough to vitiate milk that is 10 degrees warmer, it is seldom pure enough not to do harm when the milk is 10 degrees colder. Milk that has been cooled

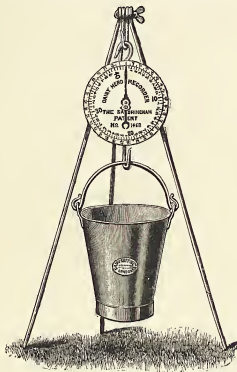


FIG. 15.—THE "SANDRINGHAM" DAIRY RECORDER.

by water or ice should not be exposed to an atmosphere that is 10 or 20 degrees warmer, for it is then a facile condenser and absorbent. Better cover it over then, to keep the air from it, and also when it is quietly falling to the temperature of the room without having gone through any other process of cooling. The

odours of the cowshed are often traceable in milk, but this is chiefly owing to the cow herself; she breathes them into her lungs, where they come in contact with her blood, and so they are communicated to the milk. This, in fact, is the "cowey" smell, which is only effectually got rid of by passing the milk over a refrigerator.

But it is not by odours only that milk becomes contaminated, and the odours are comparatively easy to deal with. In addition to them there are various kinds of bacteria or micro-organisms in the air, and these are apt to work out their destiny in so congenial a fluid as milk. They exist too in vessels which, having contained milk before, have not been thoroughly scalded and cleaned. The term "fermentative," as employed in the following quotation, covers not only the souring, but also the curdling and putrefaction of milk.

It has been ascertained that there are various forms of degradation through which milk may pass, the results arising from the action of microbes, bacteria, or fungi. As one writer expresses it:—"There is the premature souring of milk without any curdling, the thickening of it without souring, the appearance of green and blue mould and the red fungus, the swelling or foaming of the cream in the churn, or the change of it to a thin watery liquid having a bitter taste. Briefly, then, the normal souring of milk is a fermentative process produced by organisms that get into the milk after the milking is done. These organisms all get into the milk from external sources, such as air, the hands of the milker, the hair or udder of the cow, and especially from the vessels into which the milk is drawn. It follows that the number present in the milk will vary with the amount of cleanliness used in the dairy and barn. If the udder of the cow be carefully cleaned and the milk be drawn into a glass tube which by heating has been made free from all living germs, and which can be closed so as to keep from the milk all air, milk will be got so free from bacteria that it will remain unaffected for two weeks, even though kept all the time in a warm temperature."

In practical dairying it is next to impossible to keep all these

ferments out of milk, but they can be held within reasonable limits by absolute cleanliness and low temperature. Whilst milk is warm, say at a temperature of 70° up to 100° Fahr., their action is vigorous and their multiplication rapid. But at 50° they are not very active, and at freezing-point they are absolutely inert. When milk is drawn from the udder of the cow it is at a temperature most favourable to the growth and activity of these organisms: at 20 degrees above or below that temperature the conditions are less favourable, especially below it; and while freezing renders them inert, boiling destroys them.

These microbes, however, are not implacable enemies in the dairy; properly controlled, they may be regarded as friends. It is in milk that they are most of all troublesome, for it contains in addition to copious moisture, the nitrogenous food, casein, in which they flourish. But in cream, which contains but a small proportion of casein, they serve the useful purpose of developing the flavour of the butter, providing the cream be held at a temperature which keeps them but moderately active, or it be churned before they have had time to produce flavours which are disagreeable. The pleasant flavour of butter is developed by incipient decomposition, while advanced decomposition destroys it. The "ripening" of cream is simply the action of bacteria, and an advanced stage of ripening is sourness; the one improves, and the other degrades, the flavour of the butter.

It will now be seen how important are cleanliness and temperature in dairy work, and in that department of it known as butter-making, how necessary it is that cream should ripen but not become very sour. Indeed, it should not be allowed to become distinctly and obviously sour at all.

The action of these microbes in cheese is also useful and even necessary. As the cheese ripens, they become the ferment which acts upon the casein, rendering it partially soluble and developing the flavour which makes a properly ripened cheese so attractive an article of food. It is the casein and the butter in cheese which make it valuable as a food, but the

flavour which makes it pleasant to eat is the product of these micro-organisms. This flavour, indeed, as in butter, is merely incipient decomposition. The flavours of different sorts of cheese, or the differing flavours of one sort of cheese, are owing to the different kinds of microbes and fungi which are at work in cheese as it ripens; and hence it is that for special sorts of French cheese, for example, ripening-rooms are carefully managed with the view of promoting the multiplication of the desired ferments—on the floor and walls, in the air, and so on—to thoroughly impregnate the rooms with the particular spores which give to the cheese—Camembert, Brie, Roquefort, &c.—its special characteristic appearance and flavour.

Ventilation and Cleanliness.

Rooms in which milk is kept should, if possible, be cool, dry, clean, and well ventilated without draughts, the air coming into them being free from odours that may taint the milk. Butter dairies especially should be free from everything that is objectionable, be it solid dirt, liquid impurity, or atmospheric abomination; because a greater surface of milk is exposed in them than in cheese dairies, and exposed for a much longer time. Probably the chief merit of the Jersey Creamer lies in the covers which protect the milk from possible contamination by an impure air, from draughts which might interfere with the rising of the cream, and from strong rays of light, which sometimes cause white specks or flakes of coagulated casein, to appear in the butter. It is of primary importance that the floor of a dairy should be thoroughly well laid, without any joints or crevices into which milk that is spilled may run and afterwards ferment, throwing off into the air bacteria which may easily cause fermentation of the milk in the pans.

Why is it that milk in a dairy turns quickly sour at times? Were the cause traced to its source, the culprit would probably be found to be putrid milk in some cranny of the floor or walls. Staffordshire tiles, set solid in cement, the joints being perfectly closed by the same material, can be recommended as

being non-porous, and easily kept clean, either as floors or walls. No underground drains should be put into a dairy, for they are apt to choke up and foul, and are difficult to purify. Surface drains, whose exit is through a loose grid in the wall, are easily kept clean; but if an underground drain be really necessary—which will very seldom be the case, save in dairies whose floors are below the level of the ground outside—it should consist of glazed sanitary pipes whose joints are made tight with cement. A dairy built with an inner wall, between which and the outer one there is an air-space, will have a more nearly even temperature than we generally find in a dairy, and will also be dry enough for all practical purposes. And also as to the roof, an air-space should be formed between the tiles and the ceiling: that is, there should always be a ceiling in a dairy, in order to create what may be termed an air-cushion—a softener of the sun in summer, and of the frost in winter.

Dairy Equipment.

Perhaps these remarks about cleanliness are quite as applicable to a cheese-dairy as to a butter-dairy, and they are more so than to a butter-dairy in which a cream-separator is employed. But they may be used appropriately in reference to any sort of a dairy whatever, because cleanliness in all its aspects is of the greatest importance in dairy work. Where butter-making is followed on the old open-pan system—which, by the way, if properly managed, will produce as fine butter as the world ever saw or will see—the quality of coolness in summer is second only to that of cleanliness in importance. So far as the winter is concerned, the temperature of the dairy may be regulated by means of hot-water pipes running round by the wall and on the floor. Of the various sorts of milk-pans, the best are of white porcelain, or of enamelled sheet-iron. These are without seams, perfectly smooth and non-porous, and are easily cleaned; and, indeed, they have a cleaner look than any other sort.

But for its extreme brittleness, glass would be about the best

material for milk-pans ; and in a fancy dairy, ruby-tinted glass pans for milk would look uncommonly pleasing, and would present an appearance of warmth in the midst of the requisite coolness.

That all dairy vessels and implements should be of such a character that they are easily cleansed, handy to use, pleasant to look at, and not liable to get out of order or condition, will be denied by nobody who has any practical or theoretical acquaintance with dairying. 'The dairy itself—that is, the room or rooms in which the milk is kept and the work is carried on—is the first consideration ; for, if it be defective as to construction, which should be designed to secure cleanliness and the desired temperature, or if its arrangement be such that the work becomes inconvenient and irksome, frequent and almost



FIG. 16.—WHITE PORCELAIN MILK PAN.

constant disappointment with it will be the result. The best plans of dairy structures that I know of, including, of course, the internal arrangements and the equipments necessary to the work, are those designed by Bradford, of High Holborn and Salford, and a great many excellent hints may be derived from his illustrated catalogue. To such an extent has the study of improved dairying been carried in recent years, that there is now no reason, save that of expense, why anyone should have an improper dairy or inferior equipments.

The dairy workers of to-day have great advantages which those of twenty years ago had not. During this short period, the art and science of dairying have made greater progress than they ever did before in a century : I think, at all events, it is within the limit of truth that such is the case. It has been a

period of unexampled activity in the dairy, not only with practical workers but with scientific experimenters too, and the result is seen in excellent and convenient pans, separators, creamers, churns, butter-workers, milk-vats for cheese-making, and all the

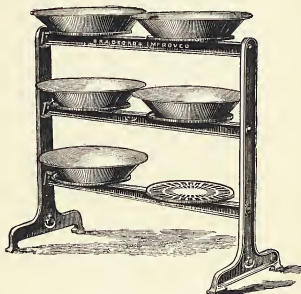


FIG. 17.—REVOLVING DISC MILK-PAN STAND.

rest of it, which go to make dairy work a far pleasanter occupation than it ever was before. Let us see, now, what milk is, and how it ought to be managed.

Milk: its Composition.

The mystery of milk-secretion in the system of the female animal of the order Mammalia is not at present fully understood, but various theories in reference to it have been put forward. It is, or may be called, a metamorphosis of tissue

and liquid which, derived of course from the food a cow eats, form for the necessary time a portion of the cow's body; it is not a mere direct change of that food into milk by the occult agencies of the digestive organs. Be this as it may, however, milk is an emulsion, and may be described as a highly-complex fluid, most beautifully designed to nourish the offspring of the animals which produce it. The specific gravity of milk, at a temperature of 60° Fahr., is about 1·030, varying a little from this in some instances; while the specific gravity of water, which is taken as a standard, is 1·000. Milk is therefore 3 per cent. heavier than water, while the cream of milk is about 1 per cent. lighter than water. An average percentage of the different elements of which milk is composed is as follows:—

Water	87·25 per cent.
Butter	3·50 "
Casein	3·50 "
Albumen	0·40 "
Milk-sugar . . .	4·60 "
Mineral substances .	0·75 "
	<hr/> 100·00

In extreme cases it has been found to exhibit the following variations:—

Water	83·65 to 90·00 per cent.
Butter	1·80 to 5·20 "
Casein	3·00 to 5·00 "
Albumen	0·30 to 0·55 "
Milk-sugar . . .	3·00 to 5·50 "
Mineral substances .	0·70 to 0·80 "

These elements again are highly complex, but I will give here only two, butter and casein, the most important by far. Butter is made up of the following fats, in combination with glycerine:—

Myristine . . .	} as solid fats.
Palmitine . . .	
Stearine	
Butine	

Butyrine . .	} as liquid fats.
Caproine . .	
Capryline . .	
Caprinine . .	
Oleine . .	

Casein, the cheesy portion of milk, has for its composition the following :—

Carbon . .	53·57 per cent.
Hydrogen . .	7·14 „
Nitrogen . .	15·41 „
Oxygen . .	22·03 „
Sulphur . .	1·11 „
Phosphorus . .	0·74 „

Neither butter nor casein are, strictly speaking, in solution in milk, but rather in suspension—the butter expressly so. Casein appears to be in the form of an extremely attenuated jelly. It is soluble in diluted hydrochloric acid, or carbonate of soda; it is coagulable by rennet and by lactic acid; and it may be precipitated by various acids. Butter-fat, in the form of cream globules, is easily seen, by the aid of a microscope, to be in suspension in milk, and each globule is a separate entity. These globules belong to the domain of the infinitely little, for a pint of milk having four per cent. of cream has been calculated to contain the stupendous number of forty thousand millions of them; and yet in healthy milk they do not touch each other! Milk, indeed, is a very complex and marvellous fluid, and that it should go quickly to the bad, if not well looked after, is not at all to be wondered at.

Cream and Creamers.

The difference of 4 per cent. of gravity which exists between milk and its cream globules enables the latter to rise to the surface when the milk remains at rest for a sufficient time. Some of the globules, however, have the peculiarity of being stationary, while a few appear to gravitate downwards, and hence it is that all the cream does not rise on milk that is “set” for creaming; and hence also the need that the milk should

remain undisturbed, in order that as much of the cream as may be so inclined will succeed in reaching the surface. The open-pan system of cream-raising, the Jersey, the Cooley, the Swartz, and all other pans or cans as well, do not therefore provide us with the best way of extracting a maximum proportion of the cream from milk.

It has been reserved to men of our own day to invent a machine, the Separator, which leaves behind in the milk less than one twentieth of 1 per cent. of the cream, whereas by skimming at the very least three-quarters of 1 per cent. remain in the milk, and generally a great deal more. In other words : skimming leaves behind in the milk at least fifteen times as much butter as separating does, simply because all the cream does not rise to the surface, and therefore cannot be skimmed.

But there is at all events a way in which the rising of cream may be hastened in pans and cans, and the principle has been adopted in the Jersey and other "creamers" I have mentioned. The late Professor Arnold, of America, told us what the principle is in the following words :—"Water is a better conductor of heat than fat : hence, when the temperature of milk varies up or down, the water in the milk feels the effect of heat or cold a little sooner than the fat in the cream does ; therefore the cream is always a little behind the water in swelling with heat or shrinking with cold—thus diminishing the difference between the specific gravity of the milk and cream when the temperature is rising, and *increasing it when the temperature is falling.*" Therefore it follows that when warm milk in a can is placed in a bath of cold water whose temperature is 40° or less, the cream rises pretty quickly while the temperature of the milk is falling to that of the water.

Under this system of a falling temperature all the cream that is inclined to rise has reached the upper layer of milk in about twelve hours, or less ; but though the milk has fallen to the temperature of the water in much less than twelve hours, the cream cannot keep pace with it, and continues to rise when the temperature is stationary. A slowly-falling temperature is considered the best after all, especially in the open-pan system ;

and it is advisable to set milk deeper in its pans in a room whose normal temperature is 50° than in one where it is 60° , because shallow milk will cool more rapidly than deep milk. In other words, it will take a longer time for milk eight inches deep than for milk four inches deep to fall from

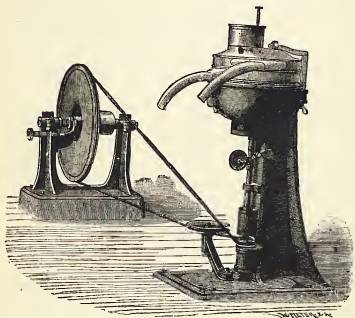


FIG. 18.—LAVAL POWER SEPARATOR, "A 1."

90° to 50° , whereas in a room at 60° the temperature would fall slowly enough even at four inches deep.

It will now be observed, from what has been said about the complex composition of milk and the theory of ascending cream, that the question of temperature in the dairy is one which has a great influence upon butter-making. It is hardly possible in these islands to have a cream-raising room that is too cool in

the summer; and, indeed, even in winter there is little to guard against, providing the milk does not freeze. Short of freezing, in fact, the milk does not become too cold for cream-raising; for in the Swartz system, which, as long since as some twenty years or more, attained extraordinary popularity in Germany and Denmark, the bath in which the deep cans containing milk are placed is kept near freezing-point by numerous pieces of ice that float in the water. But the cream which has been obtained from the milk requires to be kept at a temperature of 55° to 60° , in order that it may undergo the chemical modification which is well understood to be very useful not only to the churning which follows but to the flavour of the butter as well.

Temperature is scarcely less important in reference to milk used in cheese-making, but so low a degree is not desired. Milk, indeed, whether made into cheese or into butter, requires what I may term scientific treatment; that is, intelligent treatment, based on perfected experience. The word science, indeed, as applied to dairying or anything else, means practice perfected by study and experiment; and it is on this ground that we speak of modern dairying as scientific dairying. Experience has taught us that milk kept through the night for cheese-making the following morning must not in cold weather be allowed to become really cold; a temperature of 60° to 65° has been found to be about what is needed to prepare the milk for cheese-making. If it be allowed to fall to 40° or 45° , as it easily may in times of frost, the cheese made from it does not appear to mellow properly in the ripening process. Indeed, if it becomes too cold during the night it has need to be kept for a few hours at a much higher temperature in order to bring it round again in condition.

In the year 1880 I spent some days in the cheese-making districts of Canada, chiefly in the neighbourhood of Ingersoll, in Western Ontario. I had the privilege of inspecting several of the cheese factories that were under the control of Mr. Ballantine, the "cheese king" of Canada, who is now the Speaker of the Provincial Parliament of Ontario, which meets

in the beautiful town of Toronto. Mr. Ballantine told me he had trouble with the cheese of autumn not ripening properly, until he adopted the practice of warming the evening's milk each morning up to about 84° Fahr., and letting it stand for a few hours to mellow and ripen. This evening's milk became very cold during the chilly autumn nights, and needed warmth to restore it to condition meet for cheese-making. Subsequently to the adoption of the mellowing process the autumn cheese ripened almost as favourably and quickly as the summer cheese, and was greatly improved in character.

The vintner manages his wine and the brewer his beer with untiring care and attention, yet neither the one nor the other is so complex as milk, and neither requires more skill and judgment in order to lead to success. But in this our time there has been a great awakening of interest in dairy matters and the management of milk. The whole question is understood now as it never has been before. A great number of persons are engaged in imparting to the people the knowledge which has been defined by men who have studied and experimented for years, and there is every reason to hope that the improvement in dairy practice so far achieved and apparent will extend and expand in all directions.

CHAPTER VIII.

CHEESE-MAKING.

English Cheeses.—Cheddar Cheese.—In "The Fylde."—Cheshire Cheese.
Derbyshire Cheese.—Leicestershire Cheese.—Stilton Cheese.—Other
kinds of British Cheese.

CHEESE-MAKING is a complex art and a difficult one, while butter-making is simple and easy. Cheese-making seeks to preserve for leisurely consumption all the valuable elements of milk, which is a fluid subject to early decomposition: all the valuable elements, that is, except the milk sugar, nearly the whole of which passes off in the whey. Cheese-making deals with the casein, as well as with the butter, which milk contains; and as casein is an albuminous compound, the composition of which has been given in a previous chapter, it is the treacherous and unstable element which taxes the ingenuity of the cheese-maker to arrest and postpone its natural tendency to decay.

The art of cheese-making is to some extent analogous to the process of digestion of milk in the stomach, in this way: milk is coagulated in the cheese tub as it is in the stomach, and in both cases by the same agent—viz., rennet. Here the analogy ceases to be exact, for in cheese-making there is not the pancreatic juice of the animal to convert the coagulum into an emulsion. The process of digestion ceases in the cheese, and the course of decomposition is prolonged through the period known as the ripening period. Ripe cheese, like ripe fruit, is on the verge of decay, and some persons do not consider cheese ripe until it is in an advanced stage of actual decay. The art of the cheese-maker is employed to convert milk into a solid

article of food that will keep during a considerable period, and in such a manner that while decay is indefinitely postponed the cheese shall ripen slowly into an attractive and most excellent article of diet. The degree of its attractiveness is the measure of the skill of the cheese-maker.

In respect to the keeping properties of cheese there is very great diversity. The American cheese which comes in ship-loads to this country is, as a rule, cheese that will not keep very long; and while indeed none of it will keep long in the sense that British cheese will keep, not a little of it will hardly keep long enough to get it before the consumers here. The voyage appears to have ripened it rapidly. On the other hand, there is a great deal of British cheese that is more or less immature until it has got well into its second year. Writing in *The Times* of January 3, 1887, Archdeacon Denison says:—"I have a piece of Cheddar cheese lying under a glass on my hall table. It was made forty-one years ago. It is hard now, but it is quite sweet. True Cheddar is always best at two years."

It is, however, quite possible to make "true Cheddar" that is ripe in less than one year, and quite as good as that which takes twice as long. It is not at all desirable that cheese should take two years to ripen, save from the point of view of an epicure and an antiquarian. Practical, rent-paying farmers can hardly afford to keep their cheese two years to ripen, and dealers will not do so. The loss from interest on capital would amount to £5 a ton, plus the loss of weight, which would amount to a similar sum. Not in many cases, I fear, would the extra price commanded by ripe two-year-old Cheddar cheese reimburse the farmer for the losses indicated.

What the farmer aims at, indeed, is to produce cheese that is fairly ripe in four months, and not too far gone in twelve. There is no great difficulty in accomplishing this; indeed, there soon is none if people will only try to learn, none whatever to those who "have the know how," as our unconventional cousins in America say. Factory-made cheese is ripe sooner than that of farm-houses, but it will not always keep as long. "That is a mere euphemism," some persons may say; but it is

not, for I have tasted fine factory cheeses, on various occasions, that were more than a year old. The merit of early ripening is worth a good deal in cheese.

English Cheeses.

There are many different kinds of cheeses in England, each of which is supposed to have its own method of manufacture. In Continental countries there is a still greater variety, but we have not yet seen much need to copy the methods employed in those countries. Of the British kinds of cheese, the Cheddar, the Cheshire, and the Stilton are the most famous, and of these three the Cheshire has the most ancient reputation. Cheddar cheese is like the British people, in so far as it is cosmopolitan alike in its presence and its adaptability. No other kind of cheese is made in so many different countries and to such an extent. A century ago it was hardly known away from its natal home in the Mendip Hills of Somersetshire, but the old-world abbots of Glastonbury are supposed to have appreciated its merits. It is now made in many counties of Great Britain, in the thousands of cheese-factories of America and Canada, in Australia and New Zealand, and even in Russia, Germany, and various other Continental countries.

The method on which it is made has been brought to a science by practice, study, and experiment, and is no longer empirical at all, in the sense that most other methods are. There is reason to conclude that it lends itself better than any other to a great range of soils, climates, and countries, though some few persons imagine that only in Somerset can the finest qualities of Cheddar cheese be made. This opinion, narrow enough for fifty years ago, has been disproved over and over again. Judges of undisputed ability consider that the best Scotch Cheddars are equal to the best of Somerset, and the London Dairy Shows have corroborated this belief. Again, Canadian Cheddars are not easily beaten by those of Ayrshire or Somerset, and some of the American samples are also good. The method, indeed, has adapted itself to almost every country

where cheese is made at all, and has attained an unequalled popularity everywhere.

Cheddar Cheese.

The leading feature in the Cheddar method is the direct and intentional employment of acidity, and this is the result of carefully regulated temperature. In all well-managed Cheddar dairies nothing whatever is done by "rule of thumb." The degrees of temperature are regulated to meet the state of the weather and the season of the year, and they are extended in order to develop acidity.

The condition of the milk calls for modifications in the process, its alkalinity being a factor not to be overlooked, and its incipient acidity a condition to be met. The "ripeness" of the milk is a point which turns on the temperature of the atmosphere and on the presence or absence of electrical storms. The quantity of milk to be operated upon being known, the rennet required

is easily ascertained. The period required for coagulation is shortened or lengthened as circumstances require it to be, and the subsequent part of the process harmonises with that which has gone before. The heating of the mass of curd and whey, and the withdrawal of the latter, are points well known to the maker. The development of acidity in the whey is merely incipient, but in the curd when the whey has been lifted it is advanced. This is the oxidation or ripening of the curd, which properly supplements the ripening of the milk, and oxidation means the development of ferments which afterwards ripen the cheese.

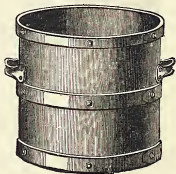


FIG. 19.—CHEESE HOOP.

One of the most intelligent Cheddar-cheese makers I have met, a Canadian, found his autumn cheese wanting in flavour and mellowness; he took to ripening the evening's milk, which had been too cold, by heating to 84° for a few hours before it was made into cheese. This ripening at a high temperature restored condition to the milk, and his cheese in the fall of the year had the mellow ripeness of the cheese of the summer. In this way is warmth harnessed to the service of

the Cheddar expert, who thus prolongs his summer into the winter, so far as his cheese is concerned.

The "nursing" of the curd, after the whey has been removed, is one of the crucial points of the system; for the moisture retained, the ripening, the flavour, the texture of the cheese depend a great deal upon it. The curd is cut into lumps, kept warm, turned frequently, noticed carefully, and at the right time is passed through the mill and salted. Too much acidity will make a dry cheese; too little, a wet one; the happy mean encourages ripening, develops flavour, and secures the proper degree of mellowness in texture. Some Lancashire cheese-

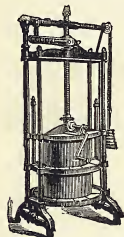


FIG 20.—DOUBLE-CHAWLER
CHEESE PRESS.

makers obtain acidity from a portion of yesterday's unsalted curd; the Derbyshire by leaving the cheese unsalted for a day, and then salting the outside; the Stilton by leaving the curd exposed whilst the whey drains from it.

Of these three courses, the first is the best. Cheese must get its ferment somehow, or it will go wrong. Salt a fresh curd, which has had no chance of becoming acid, and it is not easy to predict what the cheese will do: it may become "sweet" or bitter, it may swell and burst, and break out into running sores; or it may dry up, and become hard, "crummy," tex-

tureless, and wanting in cohesion; or it may, as indeed it commonly does, ripen out into fair cheese, and occasionally into very good. But this is all a problem—a lottery—before-hand; and at the best, where the acid is not regularly and systematically developed, there is a lack of uniformity in the cheese which detracts seriously from its value in the market.

Now I say that the practice of keeping a few pounds of curd, unsalted, to put into the next day's cheese, is an excellent practice, and second only to the Cheddar method of developing acidity by means of warmth. The curd that is kept becomes perceptibly acid in twenty-four hours, and leavens the whole lump with which it is mixed. The acid of cheese and the leaven of bread are both ferments. In oat-cake making, the leaven is got in just the same way as acid is in Lancashire cheese-making—by leaving a portion to "sour" for the next time of baking.

The exact quantity of curd to be kept cannot exactly, but it may approximately, be stated to be about 10 per cent.; this would of course be 3 lbs. of old curd in a cheese of 30 lbs. But it is obvious that the amount of kept curd will be governed by the degree of acidity which it will probably attain. In summer the quantity will be less than in winter, unless in the latter period of the year artificial warmth is employed to promote acidity in the curd.

In "The Fylde."

Ten years ago it fell to my lot to make an inquiry into Lancashire cheese-making in the Fylde country. It would be hard to find a finer tract of country for dairying, or a better class of cattle than those of the Fylde. The cheese, however, has not at present been able to acquire a distinctive national reputation like that of the Cheshire, the Cheddar, the Stilton, the Leicester, the Gloucester, or the Derby. But it has a great local name in the county to which it belongs. I visited a number of farms and watched the process. In almost every instance where good cheese was made, I found that curd was kept from one day to another, unsalted or nearly so, and at a temperature which induced acidity—say, about 65°—

and higher or lower according to the state of the weather and the time of year. The object was to have a portion of acid curd to mix with the new, and this indeed is the crux of the whole process. If the kept curd has not become perceptibly acid during the night, it is put into a warm place for an hour or two before it is wanted for mixing, and this turns it acid. Here we have in a small way a crude and unscientific parallel to the Cheddar method of developing the acid.

At one of the farm-houses which I visited, not far from Blackpool, I was deeply interested. Here were two delicate-looking, motherless girls, who made their father's cheese. They were evidently cast down with anxiety, for the cheese was generally "sweet"—a fatal fault. And yet these young women had done and were doing all that was in them to have it right. The dairy, the house—everything about the place—was scrupulously clean and in perfect order: and yet the cheese was bad. The evening's milk was cooled at once, kept as sweet and fresh as possible through the night, and made into cheese with the fresh morning's milk. No curd was kept from one day to the next, and every suspicion of acidity in the milk, and in everything else, was carefully watched. Here was the grand mistake—the exclusion of the ferments which are an aid to cheese-making,—an indispensable aid.

I explained the situation to them, advised them what to do, and went away. I have not seen them since, but heard a year ago that my advice had been followed with complete success. One of them, I heard, had married a farmer, and her cheese had taken the second prize at an exhibition! This "bread cast upon the waters," returned after many days.

I have, in a very few instances, been struck with the marked success of dairymaids who do not use a thermometer; but, after all, a thermometer would save them a power of guessing. Where we find one successful dairymaid who does not use a thermometer, there are twenty who are more or less unsuccessful for want of it. But a thermometer is not of much use unless judgment goes with it; its merit lies in saving trouble as to guessing, and avoiding uncertainty as to temperature.

Cheshire Cheese.

As the story goes, a West Indian planter, visiting his people in Cheshire, was boasting of the grand fruits he grew in the tropical island. "How often do you grow them?" asked his host. "Why, once a year," was the reply. The host left the room, and presently returning, bore in his arms a huge cheese from the dairy. "This is the sort of fruit we grow once a day," said he. An object-lesson like that was stronger than argument.

The cheese of Cheshire, indeed, has a reputation older, perhaps, than that of any other English sort, and not confined to the

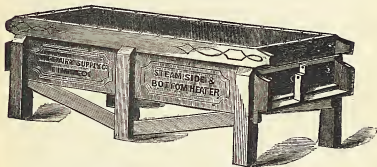


FIG. 21.—CHEDDAR OR CHESHIRE CHEESE VAT, FOR STEAM.

British Islands. It cannot be doubted that a fine old Cheshire cheese is a grand product of the dairy, second only to a fine old Cheddar, if indeed second to that, so far as the British Islands are concerned. Its reputation is not so distinctly prominent as was formerly the case, perhaps; but this is more owing to the advance which other kinds have made, than to any falling away in excellence of quality.

Some twenty years ago a tale went about the country to the effect that an extensive use of bones as a fertiliser on the pastures of the county had greatly injured them for the production of fine cheese. I have reason to believe that the tale was all nonsense, and had no real foundation; though at the same

time I am free to admit that drastic improvements done to the soil require modifications in the method of cheese-making. Cheshire farmers have found this to be the case, and have met the change successfully. No land, indeed, can be too rich for yielding fine cheese, providing the question of ferments is intelligently understood, and the curd is brought within the influence of acidity.

Cheese ovens are now general in the county—usually they are on the other side of the wall, behind the kitchen fire—and the loose curd in the vat, slightly salted or not salted at all, is placed in them for the night. This practice develops the acid, but it has the fault of hardly avoidable irregularity of temperature. It is, however, effectual for the object desired, and if

the cheese of any given Cheshire dairy varies in character, the variation is probably owing in a great measure to the difficulty in securing a uniform temperature in the oven each night in succession.

The distinguishing flavour of Cheshire cheese is considered to be owing to the soil of the keuper marl, or new red sandstone, and in some districts to the presence of alkaline



FIG. 22.—CHEESE STAND.

influences. In this event, it would seem probable that the development of acidity in the curd will be less easy than where such influences do not exist. The relatively high temperature at which the milk in many dairies is "set" for coagulation inferentially points to the influence of the great salt deposits, and is, of course, the teaching of experience.

To this question of acidity, therefore, it would seem fitting that the attention of Cheshire cheese-makers may be specially directed, on the supposition that the milk of some parts of the county is more alkaline than is usually the case elsewhere. This, indeed, is an interesting point, which well deserves careful and extended investigation.

Derbyshire Cheese.

As sound as the limestone soil from which it is produced, the cheese of North Derbyshire will usually keep a long time, and is slow to ripen. These two points are probably correlative, for, as the Americans say, "Soon ripe, soon rotten." The limestone cheese, like that of other sound soils, specially needs the help of developed ferments, because it is not naturally so liable to their intrusion as that of districts where the soil is heavy and damp. In a previous chapter I have recited how, by accident, the value of acid curd was discovered on a farm in the Peak of Derbyshire (p. 74).

The cheese as a rule is made once a day, but I have known instances in which it was made both morning and evening, from the freshest of milk. Such cheese is not salted in the curd, and not salted on the outside until the following day; it has, consequently, time to become more or less acid before any salt is applied. That is, it is *allowed* to become acid if it will, but this is not equal to *making* it become acid by the mixing of soured curd; it is, in fact, inferior to the Cheshire system of ovens.

The cheese of the southern half of the county, made on land that is not "sound"—naturally dry and firm—like that of the north, is similarly made. Owing, however, to the greater aptitude for natural fermentation, it is a mellower, though not a richer cheese than that of the limestone. In both instances the cheese is made from morning's and evening's milk combined, which is coagulated at about 80° Fahr., and there is as a rule no intentional acidity developed.

A really good Derbyshire cheese is a pleasing article of food, but it does not possess the "body" of the Cheshire and the Cheddar. There is no general and acknowledged method of making it which does not admit of numerous local variations, and consequently there is an absence of uniformity in the cheese of the county. Derbyshire, however, is not at all singular in this respect.

Leicestershire Cheese.

The damp, marly, and in some places rushy soil of this Midland county produces a cheese whose mellowness and richness of flavour are somewhat out of the common. The best of it is said to be made on land which, not having been under the plough for generations or perhaps for centuries, possesses an established and indigenous herbage. That the quality of cheese depends a good deal on the character of the herbage and soil which produce it, is sufficiently evident when we compare a Leicester cheese with, for instance, one of Derby or Stafford, above which it usually commands some 10s. per cwt. in price. There is no vital difference in the method of making, and yet the cheese is superior.

It would be interesting to have a first-rate Cheddar maker go for a day to a farm in the one county and then for a day to a farm in another, five or six in succession, with an off day between, taking with him his own apparatus, and making a cheese in each place in an identically similar manner, from, say, 40 gallons of milk. He should then ripen the several cheeses in the same room, under exactly similar conditions, and at six months' end a test of merit could be made. I have an impression that the Leicester cheese would come out equal or even superior to any of the others; this, however, is merely an unsupported opinion.

Stilton Cheese.

This is, or was originally, a Leicestershire cheese, it is believed, and was first made by a Mrs. Paulet, of Wymondham, in the Melton Mowbray district. So, at all events, we are told in Pitt's "Agriculture of the County of Leicester," published by order of the Board of Agriculture in 1809.

Mrs. Paulet was a relative of the well-known Cooper Thornhill who was landlord of "The Bell," at Stilton, Huntingdonshire. Stilton is on the great north road, and "The Bell" was one of the most famous coaching houses of its time; it is still

in existence, but its glory has departed. The cheese became famous because Cooper Thornhill supplied it to hungry travellers by the coaches, and Mrs. Paulet made it specially for this purpose. The cream only of the evening's was added to the morning's milk, and so it was a double-cream cheese. The jolly landlord of "The Bell" "gratified" his customers with it "at half-a-crown a pound"!

The method of its manufacture, kept as secret as possible, and for as long a time, leaked out ere long, and it was soon made in various places in the counties of Leicester and Rutland. The curd was not broken, but put into a sieve to drain, and afterwards tied up in a cloth. This exposure to the air induced it to acidify more or less, and the microbes of the fungus (*Pencillium crustaceum*) to gain a lodgment in it; and hence the blue mould which is so much esteemed in Stilton cheese. Its quality in those early days was owing to the double quantity of cream, and its condition to inoculation by the microbes of the air.

But in these days it is too commonly made from single-cream milk, and hence its loss of reputation. These modern Stiltons, which are made in many counties and countries, are mere imitations of what the real article is, and it is not easy to get one worth the name. To get in the blue mould is easy enough now, but when the extra cream is absent, the Stilton falls at once to the natural level of other kinds of cheese.

Other Kinds of British Cheese.

The "Cotterstone" cheese of Yorkshire resembles the Stilton in form and in colour, the result of, in some respects, an almost identical method of making. It is the chief rival of, and by many people is preferred to, the Stilton. Locally it is very popular, and as it is not very extensively made, we do not meet with it in every town as we do with its prototype.

By the simplest and least scientific method to be found in this country, the cheese of Wensleydale, also a Yorkshire cheese, is made. As there are no rules to guide a beginner, her prac-

tice becomes a copy of the one in which she happened to be taught. What is wanted is a pamphlet carefully describing from beginning to end the method pursued in the most successful dairy in the dale.

Suffolk once enjoyed a notoriety rather than a reputation for cheese. The cheese is gone, but the notoriety remains. It was skim-milk cheese, and was known under the appellation of "Bang and Thump." The poet Bloomfield sang of the Suffolk cheese, which—

"Mocks the weak effort of the bending blade,
Or in the hog-trough rests in perfect spite,
Too big to swallow and too hard to bite."

And a local rhymester said of it:—

"Those that made me were uncivil,
For they made me harder than the devil.
Knives won't cut me; fire won't sweat me;
Dogs bark at me, but can't eat me."

It is said that a man once sent out some English cheese in an iron chest to a friend in a distant land. During the voyage, which was a long one, the rats made a way into the chest, but could not get into the cheese. This cheese, most probably, was that of Suffolk.

Scotland once had a national cheese, the Dunlop, but the ubiquitous Cheddar has almost entirely disestablished it. That it will wholly disappear, however, is neither to be desired nor expected. The reputation of the Scotch Cheddars is well established in the chief markets, not of Scotland only, but of England as well. Many fine dairies exist in the south-western counties, and the Mull of Galloway is famous for the quality of its cheese. My old friends, George Cowan and James Whyte, produce a fine article in that genial part of the country, and the Fredericks, McMasters, and one or two more, are known far and wide in the world of cheese.

On many of these Galloway farms the cheese is made from artificial and temporary, instead of permanent and indigenous pastures. Rye-grass is the chief and almost only grass that is

used for the purpose, and the excellent little Ayrshires are the only cows. Proximity to the sea may perhaps have a good effect on the cheese of this Scottish peninsula, but in any case the rye-grass pastures go to show that really excellent Cheddar cheese may be produced quite independently of the grand old permanent pastures of which we are all so pardonably proud.

It is no doubt a fact that no other system than the Cheddar would succeed in producing first-rate cheese from the widest practicable range of soil, herbage, and climate, which, in many instances, are entirely disparate in character. Whatever differences there may be in cheese made under such widely different circumstances will be differences of flavour as well as of quality or richness. In the wonderful laboratory of Nature, each grass produces its own flavour from any given soil, and this it is that affects the flavour of cheese.

Cheddar cheese has been already discussed, and the remaining southern cheeses are only of local importance. The Single and Double Glo'ster were erstwhile famous enough, but they seem to have dropped a good deal out of the popular line. They were called "Single" and "Double" merely because the latter was about twice as thick as the former, and not because of any supposed difference in quality.

The "Wilts Truckles" and the "Blue-veiny Dorsets" are famous enough in their own and adjoining counties, but their reputation does not extend "far afield." The latter has a good deal of resemblance to the Stilton when cut, as its name would indicate, and it is a very pleasant cheese to eat. Some people prefer it before the Stilton.

Soft cheese is made only to a small extent in this country, comparatively speaking, and this, of course, coincides with the demand for it. Some enthusiasts have thought they could convert the English taste to soft cheese, but at present the success of the effort to do so is microscopical. It might or might not be a good thing for British dairy farmers if such a conversion could be accomplished, but in any case it would greatly increase the demand for the soft cheeses of the Conti-

ment—chiefly those of France, for many of the German soft cheeses are nasty. Those of France are pleasant to eat, but, as the late H. M. Jenkins said, himself a wise judge in dairy matters, “they are a relish rather than a food.” They are, moreover, very wasteful, for they have a thick, mouldy crust, which as a rule is all thrown away. Still, the demand in this country is increasing a little, slowly—more slowly, it is to be feared, than our population.

Rutland, the smallest of our shires, makes the smallest of our cheeses—the “Slipcote”—which is a soft cheese, made of milk with the aid of rennet, the subsequent method being much like that employed in making cream cheese—that is, no pressure is applied, and the superfluous moisture just drains away. In a few days’ time it is ripe and its coat cracks, and is easily slipped off; hence its name, “Slipcote.”

It is not often that cheese-making can be regarded as a theme for poetry. Two instances have already been given, and here is a third:—

“Would you make a soft cheese? Then I’ll tell you how:
 Take a gallon of milk, quite fresh from the cow;
 Ere the rennet is added, the dairyman’s daughter
 Must throw in a quart of the choicest spring water.
 When perfectly curdled, so white and so nice,
 You must take it all out of the dish with a slice,
 And put it ’thout breaking with care in the vat,
 With a cheese-cloth at bottom; be sure to mind that.
 This delicate matter take care not to squeeze,
 But fill as the whey passes off by degrees.
 Next day you may turn it, and do not be loth
 To wipe it quite dry with a fine linen cloth;
 That this must be done you cannot well doubt
 As long as you see any whey oozing out.
 The cheese is now finished, and nice it will be
 If enveloped in leaves from the green ashen tree;
 Or, what will do better, at least full as well,
 In nettles just plucked from the bank of the dell.”

Cream cheese is easily made: let the cream thicken with fermentation, then put it into a perforated tin or box, lined with

muslin. Otherwise it may be put first into a linen bag, and hung up to drain; later on it may be put under a light pressure, and then put into the perforated, muslin-lined moulds. In a few days' time it is ripe, in summer, and begins to develop blue mould on the surface; a few more days, and it becomes a prey to butyric rancidity. In winter it is longer ripening, and will, of course, keep longer.

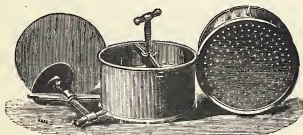


FIG. 23.—THE "GLEED" PRESS, FOR SOFT CHEESE,
(Dairy Supply Company.)

Cream cheese is at once a relish, a rich food, and a delicacy, and many people would buy it if they could. But it is rarely to be seen in shops, in many parts of the country, and the trade in it seems to be shy and irregular. Were the demand for it encouraged until it became strong and general, dairying would have another strong string to its bow.

The same may be said of "soft cheese," made from ordinary curd. The difficulty is to get our people to fancy it.

CHAPTER IX.

CHEESE AND BUTTER FACTORIES.

Where Cheese Factories Originated.—The First Cheese Factory in America.—Canadian Cheddars.—The First Cheese Factory in England.—Factory-made Cheese.—Tainted Milk.—The Babcock Milk-tester.

CHEESE factories originated in Switzerland, where the need and advantage of association in dairy work were first of all seen. Forty years ago the system was established in America by Mr. Jesse Williams, near to Rome, in the State of New York. In the autumn of 1871 I saw Williams' original factory building, which had then given place to a larger one, and was itself doing duty as a hog-pen. Cheese factories exist now in thousands on the continent of North America, chiefly in the northern and eastern states of the Union, and in the Dominion of Canada.

The best cheese in America is said to be made in some of the Canadian factories; they enjoy a more suitable climate than that of the States for cheese-making purposes. The Cheddar method, with various modifications, is the one universally employed. Canadian Cheddars have an established reputation in the markets of this country. They are made in factories, chiefly in the provinces of Ontario and Quebec, the best of them in the district around Ingersoll, in Western Ontario. The Canadians complain, however, that the finest English cheese commands twopence per lb. more than the finest Canadian in English markets, and Professor Robertson has been over to this country to learn the reason why.

We must be prepared to admit that the finest factory cheese

made in England is not equal to the finest made in farmhouses. The factory system is not calculated to produce the highest character of cheese; but the average factory cheese is better than the average farmhouse cheese. The mission of factories has been, so far, to raise the average quality, rather than to produce the finest possible article. Whether it will succeed eventually in equalling the highest individual efforts remains to be proved.

Twenty years after the opening of the first cheese-factory in America, the first in England was opened, in the town of Derby, viz., in 1871. In the same year the first one to be *built* in England was put in operation on the estate of the late Hon. E. K. W. Coke, at Longford, in the same county. These were followed by others in various dairying counties, chiefly, however, in Derbyshire. The system has not spread to the extent expected, but this is owing mainly to the extraordinary development of the country milk trade during the past twenty years.

Cow-keeping within urban districts is now to a great degree a thing of the past, and milk is sent by rail to cities and towns. Urban cowsheds were not fit places in which to keep cows, and it was found cheaper to bring milk than forage from the country. The consumption of milk by the people has enormously increased in this period of transition. Milk from the country is rightly considered a better article—purer, sweeter, and even fresher—than that produced in the old urban cowsheds, which were unavoidably unhealthy. When cows can breathe the pure air and eat the growing grass in the country, they produce healthier milk than those do who are crowded and confined in city cowsheds.

And hence it is that cheese factories have not become as numerous as was expected in England. Probably there are not more than fifty or sixty of these institutions at present existing in this country, and they are not likely to multiply very much in the future. Associated dairying, indeed, promises to find its development in the form of butter factories, especially in Ireland. At the same time, it must be admitted

that cheese factories are firmly established in this country, and that, as a rule, they have been tolerably successful, in the face of nearly twenty years' decreasing prices of dairy products.

In establishing a factory either for cheese- or butter-making, on the co-operative plan, it is first of all necessary to find out how many cows' milk can be secured. Three to five hundred seem to indicate the minimum and maximum numbers for the greatest convenience. Less than 300 do not appear to find work enough for a proper staff of hands; more than 500 become somewhat unwieldy, and some of the milk has to come rather too far. An adequate supply of pure, cold water is indispensable, and a suitable building is also a *sine qua non*. An open, airy situation is better than one that is neither, and good drainage is an absolute necessity.

Two factories of 500-cow capacity will be found better than one of 1,000, generally speaking, if they are so located as to be most convenient to the majority of the milk-suppliers. For cheese and butter making purposes milk is not improved by travelling far in closely-lidded cans over rough country roads in jolting carts, and it is an irksome thing to cart milk twice a day three or four miles to a factory, particularly when it realises only fourpence to fivepence a gallon. There are difficulties enough, without adding distance to the number. And yet, at the Shoal Lake cheese factory in Manitoba, I was informed that some of the milk was brought in the teens of miles once a day.

Factory-made cheese can hardly expect ever to equal the best that is made in farmhouses. But it may readily be better than the average quality that is produced in any given district. Some persons have said that factory-made cheese will not keep more than a few months. This is arrant nonsense; they might just as well say that brewery ale will not keep. It is really not wanted to keep, but to be eaten as soon as it is fit. But, all the same, factory cheese can be made to keep as long as farmhouse cheese, or it can be made for early consumption. Early ripening cheese will naturally not keep as long as late ripening

cheese; but it can at will be made to ripen early or late in the factories. A great deal depends always on the care the farmers take to deliver their milk in a fresh and sweet condition.

Tainted milk will not yield keeping cheese. This, indeed, is one of the chief difficulties a factory cheese-maker has to contend with—the gross carelessness, or worse, of one or more

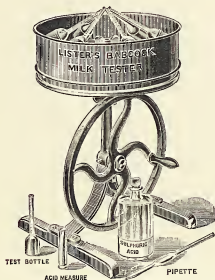


FIG. 24.—BABCOCK MILK TESTER.

of the milk-suppliers. Given sound and sweet milk, the manipulation of it in factories can be so varied as to produce a cheese that will be ripe in one month or six, save in the heat of summer, when it is not easy to make a slow-ripening cheese.

There has been much discussion about paying for milk according to its quality, when it is sent to a cheese factory. Hitherto it has been paid for at so much per gallon, irrespective of quality. Milk, however, differs in quality, some being very

rich in cream, and some very poor. Fig. 24 shows an instrument which tests samples of milk in a very few minutes, showing the proportion of cream. In this way the relative value of different milks can be ascertained from samples.

Where coloured cheese is made there is at times a difficulty in getting the colour to stand, and this difficulty is not by any means confined to factory cheese. It is owing, probably, to the action of the fermentive micro-organisms—in other words, to acidity. The Cheddar men, as a rule, do not artificially colour their cheese, and they are wise. To colour cheese at all, indeed, is an absurdity, and the sooner it is dropped the better. They may colour the outsides if they like, as the Dutch people do—this is a mere fancy, for the most part useless. But to colour the inside of the cheese is a practice which can only be regarded as foolishness.

True, the people of some of our towns prefer coloured cheese, or think they do; but this is mere foolishness. Cheese that is coloured cannot by any possibility be intrinsically better than cheese that is not coloured. Annatto costs money, and adds absolutely nothing to the quality of the cheese; but it adds *value*, so long as consumers are silly enough to prefer it. That is, these selfsame silly consumers will pay a halfpenny or a penny per lb. more for a cheese that is coloured than they will for one that is not, and, so long as they will, it is probable that makers will continue to colour their cheese. The practice, however, is less common than it formerly was, and we may hope that, as the masses of the people become more intelligent, it will gradually disappear.

CHAPTER X.

BUTTER - MAKING.

Separators.—Churning.—Washing the Butter.—Working the Butter.—
Making it Up.—British and Foreign Dairy Produce.

SINCE the year 1880, when things had gone worse in farming, we have heard no end of talk and read no end of writing about the superiority of foreign butters, but specially those of France and Denmark, and the wholesale evictions which have been always going on of English butter from the best English market, viz., London, in consequence of the imports of these selfsame foreign butters. Wherever the firkins of France and Denmark, of Germany and Sweden, were seen in the towns and cities of England, the cry at once arose that our home butter was being shouldered out by the foreign product; and when Danish butters were seen in Dublin, the capital of what might be made the finest butter-producing country on earth, some people went off into hysterics and declared it was all "up a tree" with British dairying.

That there was truth in what was said about foreign butters, we must admit, but not all or nearly all of it was truth. The chief reason why foreign butters have invaded all our cities and not a few of our towns lies in the fact that we could no longer supply our own wants from our own soil. The next reason was this: the foreign butters possessed the one important characteristic of uniformity in colour, flavour, quality, &c., which was so conspicuously absent from our own.

This uniformity was the result in Denmark of improved methods of making the butter, and of making it in large co-operative dairies, and in France of classifying and blending it in large establishments which catered for the English trade.

These foreigners, indeed, much to their credit, laid themselves out to win their way in our markets, and they have succeeded.

It is a question of uniformity, and nothing else, this success of foreign butters in England. It is not at all a question of

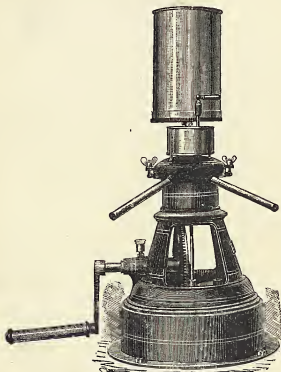


FIG. 25.—THE "ALEXANDRA" HAND-POWER SEPARATOR.

quality and inherent goodness, for in reference to this the butters of the British Islands are, to say the least, equal to those of any other country, and superior to those of most others. But we are bound to admit that our butters have been, and to a considerable extent still are, made on no regular and

acknowledged system or method, and that the product of one farm differs more or less from that of another. This diversity of character in British butters is a difficulty with which our merchants and large dealers, and indeed the retailers in many towns and cities, prefer not to be troubled; and for this reason,

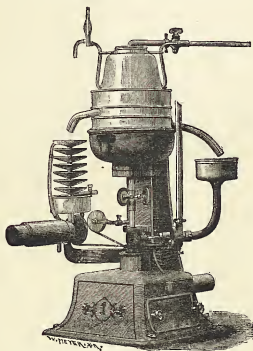


FIG. 26.—INSTANTANEOUS BUTTER MAKER (LAVAL).

far more than for any other, they find it to their advantage to deal in the foreign product.

The statement that the climate and soil in the more favoured parts of Ireland are capable of producing, and in some instances actually do produce, the best possible butter—better perhaps than that of any other country—admits of little or no doubt in

the minds of those who have had opportunities of judging: so far particularly as "body" is concerned, while as to flavour and colour they are certainly second to none. Tempered by the genial breath of the Gulf Stream, the climate of Ireland has all the mildness and moisture which promote the growth of a

rich and succulent herbage; and as the soil is almost all on the limestone, the grasses are varied in character and rich in nutritive properties.

These advantages are shared to some extent by the rest of the British Islands; it is not, therefore, in natural advantages that we are wanting for the production of the best of all possible butter.

When we come to butter-making, we have an art to discuss that is much simpler than cheese-making; and yet, for all that, the proportion of third-rate butter is, or lately was, about as great as that of cheese in the country at large. The easy-going optimism which is so common in the human family,

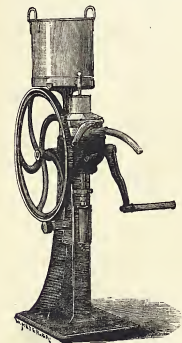


FIG 27.—LAVAL HAND-POWER SEPARATOR.
—"FARMERS' ALPHA."

and the clinging belief in which many folk indulge as to the satisfactory character of their own methods, and the too general lack there is of a desire to be taught anything different, must be held accountable for whatever inferior butter and cheese may have been produced in this country. In the future, however, no excuse will easily be found for the maker of bad

butter. With sound milk and a good dairy, all butter ought soon to be good, for there is an amazing spirit of tuition moving about in the land.

Be it understood that no one ought to lay the blame of bad butter on the tools he makes it with, for good tools are to be had; and again, first-rate butter *can* be made with the rudest appliances, in miserable dairies, if only strict cleanliness is there in all its bearings—cleanliness of milk, of pans, of room, of churn, of hands, and so forth. Among the finest samples of butter I remember to have tasted was that made by an old lady who knew nothing about such work as dairying until late in life. She was keeping the house of a bachelor son who had chosen farming as a pursuit in life. The dairy accommodation was meagre enough; but the room was cool, for it was built in the side of a hill. I asked the old lady her secret of making such excellent butter, but she said she had no secret, unless being careful about having everything clean was a secret!

Separators.

A butter dairy is not a proper room for the larder of the household; it should be used for nothing but milk and cream and butter. If it be cool and fresh and clean, good butter will come out of it. The aim and object should be to keep the milk and cream free from contamination by solid, or liquid, or atmospheric impurities. This accomplished, the butter will be good; it will be more than good, it will be excellent, if the cream be properly "ripened," and the butter be thoroughly washed at the right moment, nicely "worked," and judiciously salted. Let us see how all this may be done. In the first place we want pure, clean milk, from which we extract all the cream we conveniently can. We extract it either in open



FIG. 28.—THE "WINDSOR"—
LAVAL HAND-POWER SEPARATOR.

pans or closed ones, or by the aid of a separator, which last is best of all!

There are separators to be driven by steam engines, water,

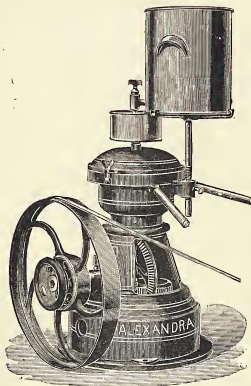


FIG. 29.—THE "ALEXANDRA" SEPARATOR.

wind, or horses, separators for hand-power, and separators which are called turbines driven by steam without an engine.

Fifteen years ago the separator was a mere embryo of what it is now. I saw the embryo at the great dairy show in Hamburg in the spring of 1877, and described it in the

Journal of the British Dairy Farmers' Association, vol. i., 1877. Since that time this wonderful invention has been simplified and perfected, and now we have it in various forms and sizes, all of them excellent. The Dairy Supply Company's hand-power separators are perfection itself for small dairies, and there are larger ones for bigger concerns. A strong lad will separate the milk of half a score cows in an hour with the "Baby" machine. These machines extract more butter from milk than can be got out by any other means, and of course the cream and skim-milk are perfectly fresh. They are really indispensable where cream and skim-milk are sold, because freshness is all-in-all in the trade for these things. It is surprising to see how much dirt, mucus, &c., remain behind in the machine when the separating is done. In this way the machine helps to purify both the cream and the skim-milk.

The following is an account of the tests made by H. P. Armsby, H. J. Waters, and W. H. Caldwell, at the Pennsylvania State College Agricultural Experiment Station:—

"The mechanical separation of cream from milk by means of the centrifugal separator has become almost universal in large creameries, the cost of the machines and of the power required to run them being more than offset by the greater yield of butter obtained and the small amount of space required, the saving in ice, and the greater certainty and uniformity of operation.

"Within comparatively short time several small separators have been put on the market, which, it is claimed, can be operated by hand and are suitable for the use of the private dairyman. This station has recently completed some tests of one of the best-known of these hand-separators, manufactured by the De Laval Separator Company, and called by them the 'Baby No. 2.' This machine was kindly placed at the station for test by the company. The results of the tests are briefly as follows:—

"The skim-milk contained, in most cases, less than five-hundredths of 1 per cent. of butter-fat.

"Out of the total possible amount of butter, but nine-tenths

of 1 per cent. was lost in the skim-milk, and but $3\frac{1}{2}$ per cent. in the skim-milk, butter-milk, and mechanical losses, or, in other words, $96\frac{1}{2}$ per cent. of the total raw material (butter-fat) was recovered in the finished butter.

"In no case was the fat for the skim-milk more than 0.5 per cent., and in most cases the amount was so small as to be a mere trace, in other words, the separation was practically complete. Calling the percentage of the fat in the skim-milk 0.05, in order to make the test of the machine as rigorous as possible, we find that out of every hundred pounds of fat contained in the milk there was recovered in the cream :—

	lb.
" In the first test . . .	99.12
In the second test . . .	99.06
In the third test . . .	99.10
In the fourth test . . .	99.13
In the fifth test . . .	99.15
In the sixth test . . .	99.10
In the seventh test . . .	99.03
Average . . .	99.10

"This is an exceedingly satisfactory result, the separation of fat from the milk being almost as complete as would be made in the laboratory by the appliances of the chemist. The quantity of milk separated per hour was as follows :—

	lb.
" In the first test . . .	212
In the second test . . .	277
In the third test . . .	276
In the fourth test . . .	275
In the fifth test . . .	292
In the sixth test . . .	277
In the seventh test . . .	270
Average . . .	259 $\frac{1}{2}$

"The machine has proved very satisfactory in the regular work of the Station Creamery.

"The use of hand power is to be recommended for small dairies."

Churning.

First of all, the churn. The variety of churns so far invented is almost infinite. But it is coming to be understood that the "end-over-end" barrel churn is the true type of the best possible churn. By all makers but one, so far as I know, these



FIG. 30.—PERFECTED DIAPHRAGM CHURN

churns have nothing inside of them—no beaters, I mean. They are just an empty barrel, and no more; and for this reason they are not perfect, despite the superiority of type. We live, and learn.

The one maker who has something more than a plain, empty churn to offer us is Mr. Bradford, whose name is a household word in all dairy districts. His churn contains what is known

as a "diaphragm"—a remarkable arrangement of mixers, which are singularly effective. Other makers of these end-over-end churns would probably adopt this diaphragm, were it not Bradford's patent. He has recently brought out an instrument which moulds and dries the butter in one operation, and in a most

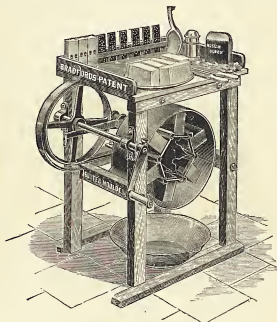


FIG. 31.—BRADFORD'S MOULDER AND DRYER.

effective manner, as well as with ease to the operator, and with great rapidity.

Separated cream, being perfectly fresh, is not exactly in the best form for churning. It is simply too fresh for the purpose though it is commonly churned in that state. It is too fresh to yield butter whose flavour is well developed. The flavour of butter is increased and improved by ripening the cream, just as in the case of fruit which has ripened. And the cream

ripens if it be kept three or four days at a temperature of 58° to 62° . After this, it churns sooner and easier, and, as a rule, more of the butter comes out of it. Each meal's or each day's cream may be mixed with that which precedes it, or it may be kept separate. But, if the latter, all of the cream intended for churning on any given day should be mixed together, and occasionally stirred about with a stick during a period of two or three hours. This is done in order that all of it may be equally ripe, equally fit for churning.

The churn should never become dirty or sour, and it should be prepared for the cream by scalding first and then cooling by

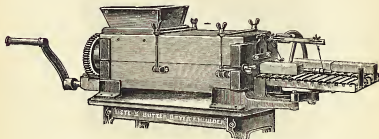


FIG. 32.—LISTER'S DRYER, MOULDER, WEIGHER, AND PRINTER.

water. If the cream is too fresh, 10 or 15 per cent. of soured buttermilk will be found to improve the butter. In this way acidity is employed when it can do the greatest good and the least harm to the flavour of the butter. But if the cream be allowed to become distinctly sour before it is churned, injury will have been done to the volatile tri-glycerides, to which the delicate flavour of fine butter is due. The process of churning should be regular as to speed, faster in the middle than at the beginning or end, the number of revolutions running up to about 45 per minute. The churn should have a ventilating valve, and a pane of glass through which the changing condition of the cream may be noticed from time to time. When the

cream no longer clouds the pane, the churning should stop and the state of the butter be ascertained.

Washing the Butter.

When the butter is observed in small granules like coarse sand, it should be washed at once, for this is the stage at which alone all the buttermilk can be got out of it by rinsing. Now is the time to let out the greater part of the buttermilk through a fine hair sieve, after which an equal quantity of clean, cold water should be poured in among the butter granules. Again let



FIG. 33.—PHOTOGRAPH OF BUTTER CHURNED "JUST ENOUGH."

out the liquid, put in clean water, giving the churn a few slow turns each time, and repeating the process until the water comes out nearly as clear as it went in. Butter that has been washed in this way is perfectly free from casein, and will keep well for weeks, without salt, in a suitable temperature. It is the presence of casein in imperfectly washed butter that explains rancidity.

The washing may easily be overdone, or carelessly done, to the injury of the flavour and aroma of the butter. Pouring the water into the churn in such a way that it falls roughly upon the butter, is not the right way to do it; but with a churn whose mouth is small this malpractice is not easily avoided. The best way would be to pour it down a tin funnel reaching

to the bottom of the churn, from whence it would rise and gently lift the floating granules of butter, washing them well as it rose. If there is any value in this idea, I make a present of it to anybody who thinks well to adopt it. With the end-over-end churns such a funnel is not necessary; one end of these churns coming wholly off, admits of the water being poured down the side—the inside—without bruising the butter at all.

When the cream is decidedly sour it is all the more necessary to wash the butter well, in order to get rid of all the taste and



FIG. 34.—PHOTOGRAPH OF BUTTER OVER-CHURNED.

smell of sourness; and in any case it is desirable to wash it in order to get rid of all the casein.

A clever instrument called the *Délaiteuse* has been invented to get the buttermilk out without washing the butter. The machine acts by application of the centrifugal principle, as a separator does, and the butter-milk is driven out of the butter without injury to its grain. It is effective for the purpose, especially if water be poured over the butter a time or two, and it leaves the butter very free from moisture (p. 126).

Many persons salt the butter with brine, which they put into the churn when the butter has been sufficiently washed. The brine, indeed, which should always be made of pure water and

equally pure salt, finishes the process of washing. The butter remains floating in the brine for a quarter of an hour, or more, during which time the churn is at rest. The longer it remains the more salt will the butter absorb, but it will hardly absorb more than it needs for keeping a week in hot weather.

Properly-washed butter will, however, in a cool place, keep

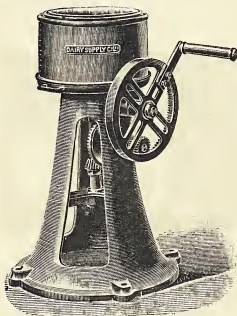


FIG. 35.—DÉLAITEUSE.

several weeks without salt at all. At the same time it may be said that butter, even for immediate eating, is better and tastier for having a little salt in it. Newly-made butter from fresh cream, without salt, is almost insipid: it needs salt, just as beef and mutton do. It will be more evenly salted with brine than with dry salt.

Where brine is not used, the butter does not remain in the

churn, to soak in the water; it is better it should not do so, save in hot weather, when the water, if cold enough, will harden it more or less. The last water is drawn off through the sieve, the churn oscillated a few times, and the granules of butter will have gathered themselves into a mass which is ready for the butter-worker.



FIG. 36.—THE BUTTER WORKER.

Working the Butter.

The object of "working" the butter is to consolidate it into a compact and close-grained mass, and to press out the super-

fluorous water, as well as to incorporate the salt, where dry salt is used. The advantage of dry salting, if advantage it be, is this: we know exactly how much salt the butter contains. It has no advantage over brining, if the butter is for early eating; but it has where the butter is wanted for keeping—for potting or tubbing. Its disadvantage is that it is not so evenly mixed with the butter as when brining is done.



FIG. 37.—THE WORKER AS A BUTTER TABLE.

A butter-worker is an excellent thing; it manipulates the butter without softening or making it greasy. In a way at once easy and effective it works out the water and works in the salt. Bradford's "Arch Albany" is only one among many, but it is first and the rest are nowhere; it is just about perfect, and the

others are not. That idea of his—of a “helical roller” for his “worker”—was one of Mr. Bradford’s many fortunate inspirations. The butter is rolled out into a fluted cake, and rolled up again into a lump as quickly, and yet as gently, as we like, and all dairymaids sing its praises who know how cleverly it does the work for them.

Making it Up.

This is done now with boxwood pats, called “Scotch hands,” for people are agreed that the butter is all the better and harder if not touched by dairymaids’ hands, or dairymen’s either. Few human hands are cold enough to knead butter and not injure it, and among the physiological processes which are always in progress in our bodies moisture and gases are exuded through the pores of the skin—much more through some persons’ skins than others’. These are likely to taint the butter.

To end the argument, I may remark that there is no need whatever why butter should be touched by hands of flesh when hands of boxwood do the making up so much more nicely. The best market form—pounds and half-pounds—of butter is that of a brick; this form packs better than any other except cubes, and is convenient for lifting and moving about.

Grease-proof paper, air- and damp-proof too, is the best possible material to fold up butter in, and the parcel may then be packed in a box (Fig. 38) for transit to market. For sending through the post, or by any other possible means, these chip cases, themselves tied up in brown paper, are excellent.

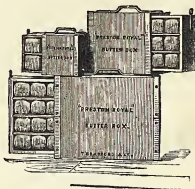


FIG. 38.—BUTTER BOXES.

For exhibition purposes butter becomes modellers' wax, and lends itself readily to purposes of temporary ornamentation. Wonderfully beautiful groups of flowers, in the form of grand bouquets, whose modelling and arrangement were exquisitely chaste and delightful, have been greatly admired at the London Dairy Shows.

These uses for butter are of course purely adventitious, but at the same time there is no valid reason whatever why butter should not be put into gala form at times, and used for ornamental purposes. The Shows alluded to are the harvest festivals of the great dairy industry of these islands, and a display of butter, done up in forms of beauty, is singularly appropriate as well as attractive.

British and Foreign Dairy Produce.

In another chapter I have alluded to the importance of uniformity in the quality and character of dairy products. Herein we find the chief reason why Continental butter and American cheese have obtained so much favour in the eyes of provision merchants in the great centres of population in this country, particularly in London, which is the greatest of all. The French "blend" their butters in large quantities and so attain uniformity; the Danes secure it by means of their co-operative dairies, or creameries; the Americans attain it in their cheese, because it is made on a large scale in thousands of cheese factories.

That foreign cheese and butter surpass our own in quality I am not prepared to admit; on the contrary, I believe there is no cheese made in America equal to the best produced in England or Scotland, simply because the climate and herbage of the great Continent of the West do not admit of it, and I am equally convinced that nowhere in France or Denmark or any other country is there butter to be found quite equal in all respects to the finest samples we have in the British Islands. One of our great London provision merchants has encouraged in the

south of Ireland an establishment where many farmers' butters are blended on the Continental method, and the business was rapidly increasing the last time I had a report of it. There are also creameries or butter factories in that country, as well as in Great Britain, and these produce butters sufficiently uniform to command higher prices than the butters of France or Denmark.

This ought to be proof enough that, if we will, we can surpass all other countries; it is our equable and yet variable climate, which is given to frequent changes, though not to greatest extremes, and is withal pretty constantly humid, that gives us our advantage.

And, again, some of the cheese factories of England turn out cheese that is even more uniform than that of America, and is therefore preferred by dealers and consumers alike. The want of uniformity, indeed, which characterises a great deal of the cheese and butter made in British farmhouses, quite apart from the question of quality, is a great and chronic source of loss to farmers in all parts of the country.

The newest development in butter-making is the use of "pure cultures" of bacteria to ripen the cream, and it is calculated to accomplish a great and beneficent improvement in an industry of vast importance. The merit of the process lies in cultivating the sort or sorts of bacteria that are essential to the production of fine butter, and in excluding those that do harm. It is understood that of the many kinds of ferments to which milk is subject, only some three or four are of real service to the butter-maker; these are now "cultivated," and the preparation is already an article of commerce. A given quantity of this "starter," as it is called in some districts, in a given number of quarts of cream, some hours before churning, causes the cream to ripen, and, as a sequel thereto, the flavour of the butter is developed. In dairies where fine butter is, and has long been, produced, it is a foregone conclusion that the atmosphere is impregnated with the necessary bacteria; and it is probably true that in other dairies, where inferior butter is constantly made, the wrong sorts of bacteria are present in numbers far too great, to the exclusion of the beneficent sorts.

CHAPTER XI.

FOREIGN BUTTER-MAKING.

The Royal Danish Agricultural Society.—The Centrifugal Cream-Separator.—“New Sour.”—Ripening Cream.—A Good Churn.—The Washing of Butter.—Co-operative Dairies.—Germany.—Not to Touch Butter with the Hands.—“Margarine Men.”

IN a pamphlet recently issued by the Board of Agriculture, for copies of which I am indebted to the courtesy of Major Cragie, there is much valuable information supplied on the “Dairy Farming of Denmark, Sweden, and Germany.” I quote the following paragraphs, which are within inverted commas :—

“The importance of fostering the dairy industry was first recognised by the Royal Danish Agricultural Society, and the encouragement offered by this society, subsequently seconded by State aid, induced a number of eminent scientific men to undertake a series of investigations with the object of determining rational principles for the various processes of dairying. As a result of these inquiries the thermometer and scales were adopted as indispensable appliances in properly managed establishments, and a reliable and detailed method of book-keeping was gradually introduced. These useful innovations were followed by the organisation of a systematic and thorough scheme of practical instruction in dairy management.

“Now, it is remarked, almost all Danish agriculturists, whether the landed proprietor with his three hundred cows, or the crofter (*Huusmand*) with his one or two, with like zeal and with equal profit, comparatively speaking, take part in the manufacture of butter.

“This has been mainly brought about by the adaptation of centrifugal power for obtaining the cream from the milk, introduced into Danish dairies about ten years ago. At the present

time steam centrifugal separators are employed in all parts of the country by large proprietors and farmers. The dairies are either run by landowners who buy up milk from small farmers and occupiers (*Fællesmælkerier*), or co-operative societies (*Andelsmælkerier*) are formed by the farmers themselves for the purpose of establishing factories, to which the milk is consigned by the shareholders and made into butter.

"The centrifugal separator is now to be found in almost every dairy in Denmark, but in some few instances creaming is still carried out by the ice and cold-water processes. It has been found that very appreciable deficiencies in the yield of butter might arise if the cream was not immediately cooled to from 46° to 56° Fahr. after separation.

"Bacterial preparations for souring cream are said to be used with advantage in a few dairies, but they have not yet found general application in Denmark. M. Böggild states that it is becoming more and more recognised that the quality of the butter depends largely on the souring of the cream. In those cases where the cream cannot be allowed to stand and get sour, the cream is soured by the addition of butter-milk, or cream reserved for that purpose from the previous day.

"A preparation known as 'new sour' is now largely used for souring the milk." (Cream is here, no doubt, meant.) "It is generally made by exposing cream, half-skimmed milk, or new milk to such a degree of heat as is considered sufficient to develop the souring processes. M. Böggild urges the necessity of keeping the souring uniform from one day to another, otherwise the butter will vary on different days.

"Experience has shown that uniformity in quality seems to be best obtained by using as a souring medium the butter-milk produced in the dairy. The use of 'new sour' is recommended in those instances where the quality of the butter is unsatisfactory, and especially where the milk comes to the dairy in various conditions as regards freshness, purity, and flavour."

The term "ripening," as used in England, is practically equivalent to that of "souring," as used in Denmark; but the souring in the latter country appears to be introduced into the

cream at, or not long before, churning time. I may remark here that the best sample of butter I remember to have seen was at an international dairy show at Dublin (on which occasion I happened to be one of the judges of butter), and it was made by the aid of souring the cream at churning time—the souring medium being butter-milk from the previous churning.

X Where the cream is intelligently ripened—that is, brought to the verge of sourness—the souring by butter-milk may not be needed, and indeed is not needed, but where the cream is comparatively fresh when churned, there can be no doubt that souring in the manner indicated is a distinct advantage alike to the process of churning, and to the quality, flavour, colour, and firmness of the butter.

X “A good churn, in M. Böggild’s opinion, should produce butter in from twenty-five to forty-five minutes from cream churned at a suitable temperature. It should be so constructed that its velocity, as well as the temperature of its contents, can be easily controlled and regulated. It should be easy to fill and to empty, to clean and to ventilate. The material of which the churn is constructed should allow the butter to slip easily; it should be a bad conductor of heat, and should impart no flavour or odour to the butter. These latter requirements are best met by a churn made of hard wood, such as beech or oak. During the operation of churning the temperature of the cream in the churn should not rise more than 3 degrees Fahr.”

The Danes allow a greater range of temperature in their cream when it is put into the churn than, with carefully ripened cream, we in this country should consider necessary or discreet. In that country it may in part be a question of extremes of climate which permits a range from 50° to 68° Fahr.; but in well-appointed dairies these extremes are kept well within bounds by artificial means, and a very high temperature of the cream, even in winter, ought to be quite unnecessary.

It appears that the Danes do not generally wash the butter in the churn, as we do, but, when they wash it at all, it is taken from the churn and put into a strainer, which is merely dipped

into a tub containing water which has been boiled and allowed to get cool ; in this way the water flows over the butter and washes the butter-milk off the outside of the mass, though it cannot very well wash it from the inside—unless, indeed, the butter is still in so granular a condition that the water can permeate throughout the entire mass.

It is thought that the washing of butter may carry off the delicate aroma, and therefore be "detrimental to the bouquet of the butter." But if the washing be carefully done with pure water or good brine, there is no danger whatever of injuring the aroma of the butter. Often have I seen in this country carefully washed butter with its delicious aroma not only not injured, but certainly improved by the removal of all the butter-milk and with it the sour smell of the cream.

It is probably true that butter may be injured in the way suggested in churns which have so small a mouth that the water for washing unavoidably falls heavily on the butter inside, but this may be obviated by pouring the water carefully into the churn. The kneading of butter by the hands has been discontinued, and butter-workers are used instead in all the better establishments.

"The development of the dairy industry in Denmark has been accompanied by a remarkable extension of the co-operative system. This system has been adopted to meet the want of organisation felt by the farmers, and has proved eminently successful as far as the dairies are concerned."

It is estimated that about one thousand co-operative dairies exist in this little country of the Danes, and herein we have an explanation of the "uniformity" which marks the Danish butter. These establishments are managed under "articles of association" which cover every conceivable point in reference to the milk and the butter ; and in addition thereto—in order that the members may obtain cheap and good feeding materials—the directors "arrange for the purchase of such materials in bulk," and deliver the same to the members. "In order to insure that the butter may at all times have a satisfactory aroma, every member is bound to purchase so much rape-cake as shall

furnish at least 1 lb. of cake daily to every cow during the winter."

Sweden has followed the lead and copied the methods of Denmark, and is now also reaping the benefits which accrue from co-operative butter-making.

Germany.

Ten years ago there were less than two hundred large dairies, private and co-operative, in Germany, excluding Bavaria, and the number of these has since risen to 2,673, of which more than a thousand are worked by co-operative associations of farmers. The principle of co-operation is spreading in Hanover, and, indeed, throughout the dairying sections of the Empire.

The separator is used generally, though in a few establishments the once equally popular "Swartz" process is still employed. This last, however, will gradually disappear, for there is no "system" of creaming that can compare at all favourably or even equally with the separator.

"The cream is nearly always allowed to turn before being churned; only in a very few districts is the cream churned sweet. As regards the question of the degree of sourness of the cream, Dr. Schrodtt, late Director of the Kiel Dairy Station, remarks as follows:—'The butter was manufactured from slightly soured cream. The cream obtained from the separator in the morning was immediately cooled to a temperature of 46° to 50° Fahr., and allowed to remain in the cellar until the evening of the same day, when the process of souring was begun. This, in the cool season of the year, was carried out by warming the cream to 59° to 68° Fahr., and keeping it at that temperature for about thirty-six hours. In the summer season the cream was not warmed, but attention was rather directed to keeping it cooler for a longer period, according to the temperature of the atmosphere. After about thirty-six hours the cream, under the influence of a suitable temperature, had attained the desired degree of sourness, and was thus ready for churning in

about forty-eight hours after leaving the separator. This extension of the usual duration of the souring process was made with the object of overcoming the more or less frothy condition of the cream from the centrifugal separator in order to obtain a firmer butter."

The washing of butter in the churn is not a general practice, but it is recommended when the cream is very sour, or when little or no salt is used. In some establishments it is washed while on the butter-worker; but it is obviously too late, there, to wash it perfectly.

The practice is not to touch the butter with the hands. This indeed was followed out at the Roden Dairy Station in 1877, in which year it was my good fortune to pay a visit of inspection to the estate of Graf von Schlieffen, in Mecklenburg, where the station is situated. It was then under the superintendence of Dr. Wilhelm Fleischmann, to whose experiments and teaching the dairying of Germany to-day is so greatly indebted. The butter is first passed lightly through the "worker," and then put into a cool place to harden, after which it is again passed through the worker.

An enormous quantity of margarine is still sold for genuine butter, as the convictions of offenders testify, and it must be borne in mind that these convictions represent only a small percentage of the offences committed.

Margarine has been too tempting for the virtue of some dairy farmers, or its competition has been too strong—in any case it has been used in farm houses to adulterate home-made butter.

German butter-makers, equally with those of England, have reason to complain of the nefarious competition of the margarine men. The time has arrived when, it is considered, very stringent laws should be passed to effectually prevent the sale of margarine under false pretences.

CHAPTER XII.

THE MILK AND CREAM TRADE.

Dairy Cattle Statistics.—Consumption of Milk.—Milk Adulteration.—
Separated Milk.—A Difficult Point.—The Middleman's Profits.—
Urban Milk Trade.—Preserving Milk.—Milk and Railways.

Dairy Cattle Statistics.

THE number of cows and heifers in milk in the British Isles varies a good deal, and this variation is the cause of the fluctuations which occur in their value. There were 3,946,259 in 1887; in 1889 there were 3,814,593, showing a decrease in two years of 131,666; but in 1890 there were 3,956,220, being an increase in one year of 141,627. In 1891 they had again increased, and, as a consequence, their value declined in the markets. In 1892 the increase continued, and the price of cattle fell very seriously, though cows "on note" to calve were in good demand in the last quarter of the year, owing to the scarcity of milk.

Bearing on this question of fluctuating values, which are caused by varying numbers, I may remark that dairy farmers will find a constant benefit by studying the agricultural returns of Great Britain, which, having been collected by the 4th of June in each year, are, or ought to be, issued some time before Christmas. These returns give statistics of the number of cattle in each separate county and in the British Isles as a whole: sheep, horses, pigs, and all kinds of crops are also tabulated, so that anyone can see at a glance the increase or

decrease that may have occurred in any given year embraced by the returns.

Such a study will be found valuable as a guide, particularly when it embraces five or six consecutive years, showing the tendency of the period in respect of numbers—a guide as to holding cattle or selling them freely. I have had these returns since they were first issued, now more than twenty years ago, and have found them always a valuable forecast of the future, in reference to the price of stock. These remarks are now made in the interests of farmers who go in for the milk trade; farmers who depend wholly or in part on the markets for their calving cows; and indeed for all farmers whom they may concern, whether in the milk trade or out of it.

The returns are not absolutely correct in every item, but they are at all events approximately so each year in succession, and therefore they supply for comparison data which are sufficiently accurate for purposes of estimate and forecast. There are, it appears, a few farmers here and there who decline to fill in their returns—an unpatriotic thing to do. But for these, and for inaccurate returns in other cases, the statistical returns would be absolutely reliable.

Consumption of Milk.

The consumption of milk by the people of our great centres of population has increased enormously in the past twenty years, and the milk trade is of supreme importance to the dairy farmers of Great Britain. There are various reasons for the increased consumption of milk, as a beverage and in various cookeries, the first and foremost of which is the improved position of the working classes. Without railways the trade in country milk was impossible, save within an easy distance of our towns and cities. The Food Adulteration Acts have also been a wholesome caution to milkmen who were inclined to be too free with the cow whose tail is of iron; but the time has arrived for them to be extended and made more stringent.

Then again, many members of the medical profession recom-

mend milk to their patients; and, though last not least, the Blue Ribbon Army, by their earnest advocacy of non-alcoholic drinks, have helped very materially to increase the consumption of milk. All this is, of course, as it should be, for it is not very pleasant to think of the condition our dairy industry would have been in but for this selfsame milk trade. The enormous consumption of tea, which has no nutritive value, very seriously interferes with that of milk, which has a very high nutritive value; but it is hopeless to expect tea-drinkers to give up entirely their favourite beverage, and take to milk instead. The poor, however, may well be advised to do it, for economy's sake.

It would be interesting to ascertain how many cows are kept for the milk trade, how many for cheese, how many for butter, and so on. The late John Algernon Clarke, one of the best writers on agriculture which this country has produced, estimated that the people of the British Islands consumed an average of one-third of a pint of milk per day; in this case the people of London alone require the services of more than 160,000 cows to provide them with milk, not to mention butter and cheese, for which upwards of 400,000 more cows are required. Much of London's cheese and butter, however, come from foreign countries, whereas the whole of its fresh milk is produced at home.

Milk Adulteration.

In a previous chapter (pp. 86, 87) I have given the component parts of milk in units and fractions, and to these my readers may be now referred for purposes of comparison. Milk that is sold to the public is required by the public analysts to have a minimum standard quality as follows:—

Solids, not fat	8.50
Fat	2.50
This will leave a permissible	89.00 of water.
	<hr/> 100.00

—a quantity but seldom found in any milk as it comes from the cow. Inspectors are constantly on the look-out for people who are inclined to defraud the public by selling milk adulterated with water, or milk which has been robbed of a portion of its cream. Convictions of such people frequently occur, and this ceaseless supervision is necessarily a permanent thing. These inspectors, whose duty lies in protecting the public from imposition, are expected to use great diligence in detecting frauds in milk, and it would go hardly with one if he were found to connive at such practices.

But it is not in every case the dealer's fault if milk falls below the standard minimum of quality; sometimes, be it admitted in sorrow, a farmer's own sense of honesty is not quite immaculate. Sometimes, again, the milk may be brought below the limit by feeding cows on food that stimulates quantity of milk at the expense of quality—on excessive quantities of brewers' grains, malt-culms, and so forth. It is, however, not an easy thing in all cases to adulterate the milk through the mouth of the cow: much depends on the cow, whether she is naturally inclined to yield inferior milk, as the Dutch cows do—milk that under any system of feeding, however good, will always contain too large a percentage of water.

Separated Milk.

The milk trade owes a great deal to the refrigerator and the separator; the cream trade is almost wholly dependent on the latter. The surplus milk on a dealer's hands can now be dealt with in a way which reduces loss to a minimum, so long as it has not soured and thickened. The separator, indeed, is indispensable. Surplus milk is at once run through this wonderful machine, and its most valuable ingredient, the cream, is secured for sale or for the churn.

But what is to be done with the separated milk, which in itself is a valuable article of food? The demand for separated milk is not large, and the price it will command does not pay the expense of an elaborate system of distribution. The diffi-

culty is felt by the dealers, who dispose of it as well as they can, or else pitch it into the sewers. For bread-making it is an excellent thing, and the great bakeries would no doubt use it extensively if they could have a regular supply of it. Such a supply is forthcoming in cases where a considerable cream trade exists.

Complaints have been recently heard to the effect that some dealers mix their separated milk with the next new milk they receive. This is an efficient method of lowering the quality of milk without specific adulteration, but the mixture is deficient in cream if much of the separated article be added. The best end of separated milk is to have it sold, if possible, at a penny a quart; and it is well worth the money. The next is to feed it to pigs or calves, to the cows themselves, and to young horses, for all of which it is excellent; but to do this it must be kept in the country, for these animals cannot be kept in the town.

The Central Dairy Farmers' Association not long ago resolved to ask the Minister of Agriculture to bring in a Bill to establish stringent regulations against selling separated milk as new, or mixing it with new milk. There is only too much reason for this, and the present state of affairs was well declared to be a detriment to producers, retailers, and consumers. It is to be hoped that such legislation will not long be delayed, for it would be welcome to all honest people, and rogues deserve no mercy.

At the same meeting of the Association a resolution was adopted urging the necessity of having a standard quality for milk fixed for the whole of the country. A minimum standard is meant, and in this case the one cited on p. 140 might, perhaps, meet the requirements of the farmers, the dealers, and the public. A recognised and compulsory standard would be an advantage to everybody concerned.

A Difficult Point.

On the other side of the picture there exists the difficulty of adequate payment for milk that is unusually rich in solids.

Payment on a quality basis would be fair to everybody, if it were only practicable. The difficulty exists, and it is a hardship in many cases. A 'cute milkman can increase his profit by watering down the genuine rich milk that farmers send to him, keeping on the right side of the standard. It cannot be denied that pure milk as it leaves the farm is generally two or three per cent., or more, above the required standard in quality, and this difference provides a margin which a dishonest dealer can manipulate to his own profit and the farmer's loss. The farmer, as a rule, is perfectly innocent of manipulation of this kind. It will freely be admitted that the great majority of dealers are perfectly honest; it is the few in either case who make the elaborate machinery of the law a necessary and a permanent thing.

Milk is constantly varying in quality, and will hardly be exactly the same, even from the same cow, in any two consecutive weeks, or even days, unless the food and the weather remain uniform. Any dairy farmer may verify this for himself, so far as the cream is concerned, if he possess himself of a set of cream-gauge glasses, and use them intelligently. These unavoidable fluctuations in quality do not, however, matter much if only the average quality be right. But the farmer whose milk is always of a high quality seldom receives the price he is really entitled to. This, however, is in another way a benefit to him—viz., he is always sure of a customer. The dealers are well aware whose milk of all they receive is the best, and this is the milk they will cling to when some of the rest is cut down or discarded.

The farmer who, selling his milk retail in some town or other near to which he resides, maintains a high standard of quality, will keep his customers together and receive good prices, no matter who comes against him. In a case like this the farmer receives all the pay, and all the credit too; but when he sends his milk to a dealer he loses this double advantage. This last is the penalty of location; unless the farmer is within a moderate distance of the consumers, he must needs commit the retailing of his milk to a "middleman."

The Middleman's Profits.

A great deal has been said and written about the assumed extravagant profits of the middleman in the milk trade, but it has not always been well said or well written. The middleman's expenses in a town or city swallow up a larger proportion of the supposed profits than many people are aware of. The trade is a harassing trade at the best.

The dealer who receives country milk and retails it in a town has only a limited time each day to do the work, and therefore requires more men and horses than he otherwise would. Milk required for householders' breakfasts must be delivered in time, and it has to be fetched from the railway before it can be delivered to anybody. It is said that four thousand horses are required by the trade in London alone, and more hands than are wanted to milk the cows whose milk they distribute. The horses must needs be well fed, and the men well paid, for work which is done while half the world is in bed. All the milk coming in from the country must be sampled and tested as a general thing, and the large dealers have skilled analysts constantly employed for their own protection.

Milk is so liable to septic infection, to early and rapid decomposition, that great loss in it frequently occurs in hot weather. The only practicable safeguard that can be generally employed is thorough cooling and aëration as soon as the milk is taken from the cow. The utmost difficulty exists in regulating the supply to the demand. One day the dealer has too much milk, another too little, and retail customers are often both unreasonable and exacting. Too little is better than too much, within limits; but if there be always too little the trade falls off.

Urban Milk Trade.

Creameries or cheese factories situated in the country lend themselves admirably to the vicissitudes of an urban milk trade. When the demand for milk falls off in London, or in any other large city, the retailer wires to one or more of his farmers to

keep back a meal's or a day's milk, and this is always an awkward thing for the farmer. But where a factory is worked along with a milk trade, the plan appears to answer very well indeed. Any of the cheese factories which are within reasonable distance of a railway may probably be inclined to supply milk to dealers in times of scarcity.

It is obviously undesirable to send to a town, on any given day, more milk than the town requires; the balance may best be dealt with in a creamery or cheese factory, be it much or little. There are drawbacks even to this, of course, but they are reduced to manageable limits, and potential losses are avoided. A creamery can do almost anything in reason—down to making margarine and margarine cheese; separated milk, with margarine added, has sometimes produced cheese that was surprisingly good; the difficulty is that it cannot prosper much while ordinary cheese is down below 50s. per cwt.—there is no room for it then, it is not wanted. I cannot advise the managers of any creamery to begin making margarine cheese. The reputation of American cheese in this country has been seriously injured by the margarine counterfeit which has been sent over. The loss to American dairying from this cause is just incalculable—ininitely greater than any possible profit which the counterfeit may have yielded.

But, on the other hand, at a creamery the best possibilities of dairying may be reached, a trade in cream may be built up, the finest butter can be produced, an urban milk trade can be met at every turn of demand, a timid demand for separated milk may be encouraged till it becomes a vigorous and valuable trade; or the separated milk may be devoted to any other legitimate purpose—to the making of buttons, door-knobs, and so on. I have capital samples of them before me as I write—hard, bright, close-grained as ivory—but how they are made I cannot say.

The cream separator is the good genius of a creamery, or of any other establishment where butter is a speciality; it is just as indispensable as a mowing machine is in harvest time. If you get the cream out of the milk whilst both are perfectly

fresh, you are master of the situation and can do what you will with them. To a cream-trade a separator is a vital necessity, and it is equally so, no doubt, to a first-rate butter dairy.

Preserving Milk.

The milk trade would be simple and easy, if not altogether pleasant, if milk were not such a perishable thing. But now a new and perhaps important method of preserving milk is announced. This method is said to completely kill the bacteria which exist in all milk, and are the cause of fermentive and putrefactive changes. Completely destroy these organisms and the germs by which they multiply, and milk will keep an indefinite period if the air is excluded from it; the object of excluding the air is to prevent the introduction of microbes, and to keep the milk in a sterilised condition.

The method is to heat the milk repeatedly, first up to 160° Fahr., and finally to 212° , with intervals between the heatings; in these intervals the milk cools down, and the germs of the bacteria develop into a state which admits of their complete and final destruction, at the higher temperature named. The method involves trouble and expense, and the milk has to be put into air-tight vessels. Milk treated in this way is said to remain unchanged for months, and to yield up its cream like fresh milk—to be fresh milk to all intents and purposes—when the vessels containing it are opened.

The process has been patented by its inventor, a Norwegian, and a company is understood to have been formed with the object of sending milk to this country. The feasibility of all this may be admitted, but the profit is doubtful. The costliness of the process, the weight and bulk of the milk, and so on, seem to preclude all but a microscopical profit, if even that. A gallon of milk weighs 10 lbs. 4 ozs., and is worth 6d. to 8d. wholesale in London: the freight will probably be too great, and the empty cans can hardly be returned free. It seems to me that we have not much need to fear a deluge of Norwegian milk.

Milk and Railways.

That the milk trade is of enormous importance to dairy farmers will on all hands be admitted. It is, as we know it now, almost wholly a development of the last twenty-five years. But for railway facilities it would be an impossible thing. The railway companies, indeed, hold it in the hollow of their hands; they can develop it to any practicable extent, or they can kill it by neglect, as they please. But it pays them well as it is, and will pay them still better if they treat it in a fair and generous spirit.

Hitherto most of the companies have shown a disposition to give the milk trade tolerably fair play, if no favour. But as milk is a farm product, and as all products of the farms of these islands have been called upon to pay higher freight rates than foreign products of a like nature, milk has not yet met with the favourable treatment it is entitled to on the part of the railway companies. The milk trade is a constant and regular morning and evening thing, all the year round, and for this if for no other reason it ought to command due consideration from the directors of railways.

The prosperity of dairy farming in Great Britain depends to a very serious extent on the action of the railway companies in respect of the milk trade; there is, in fact, not a dairy farmer in the whole of the British Islands who is not directly or indirectly interested in this question. The Board of Trade has some considerable amount of influence over railway rates, and the farmers of this country have every reason to expect that the Board will see that they are not prejudicially hampered by railway charges that will starve their business and interfere with their livelihood. For, after all, directors as individuals are but human, and as companies they are supposed to have no conscience.

The farmers in the district of Bakewell, Derbyshire, which is a milk-producing and milk-selling district, for the most part send their milk to dealers in Manchester, or some other large town in Lancashire or in Yorkshire. They sell at so much per

dozen quarts, and the gross price is now 1s. 8d. for the winter. The freight charges are 2½d. per dozen, so that the net price is a fraction under 6d. per imperial gallon.

Now, 6d. a gallon as a steady price would answer their purpose well enough, as things go in the world, at all events in three out of the four quarters of the year—or, rather, in two out of the three-thirds of it, the omitted third including the months of November, December, January, and February. Sixpence a gallon, “clear up,” is not a ruinous price for milk during eight out of the twelve months as indicated. It is better than cheese and butter making have been on an average for ten years up to date. It is, in fact, just about the equivalent of 7d. per lb. for cheese and 13d. per lb. for butter.

But it is not the clear net price, for the milk-cans must be debited to it, and also the wear and tear and time of men, horses, and vehicles going constantly to and from the railway stations. Sometimes the milk is returned, and carriage both ways has to be paid; it is then probably sour, and all that can be done with it is to churn it, get out all the butter possible, and feed the butterless milk to the cows and horses. Sometimes it never reaches its destination at all, is lost, and the cans turn up weeks afterwards, or never turn up at all. All risks, in fact, are the farmers' own, and all charges must be debited to the gross price paid for the milk. Sometimes, indeed, a dealer goes wrong, and the farmer loses a month's milk. The winter's price was formerly 2s. 6d. per dozen, and the summer's 2s. These prices were a luxury, or would be considered a luxury now.

The trade itself is not a luxury, for it is full of annoyances—cans kept back by the dealers or the railway people, milk turned sour and returned, or perhaps lost altogether, trains missed by a minute or two, cans smashed by the porters, carts smashed by careless men, dealers defaulting, milk short in winter and dealers complaining, milk too plentiful in summer and dealers disdaining, and so on, from year's beginning to year's end. All these irksome things, however, could well be borne if only the trade were really profitable.

The conditions in the winter of 1892-3 are peculiarly unfavourable ; the value of hay has doubled in a year, and various other feeding stuffs are dearer than they were. Brewers' grains, which are a useful, bulky food, particularly useful when hay is scarce, are much increased in price ; malt-culms, bran, maize, and so on, are dearer than they were when milk was making more money than now.

The low price of milk is in part, if not wholly, owing to the supply, which is greater than formerly was the case. This it was which enabled the great milk-dealers of London to drop the retail price to 4d. a quart. The Aylesbury Dairy Company set the example, and it had to be followed by others. The drop is a boon, no doubt, to the poor in some parts, but not in the same sense is it a boon to the wealthy people who inhabit the West End of London, to whom quality is more important than price. It has led, no doubt, to increased consumption, but so far there has been no reaction in price. The drop, indeed, has affected the dividends paid by the great milk-dealing companies and the profits of the smaller men, but the chief loss is borne by the farmers. A sudden drop of 20 per cent. in the retail price of milk is a serious thing for those who are engaged in producing it, for it is they upon whom the loss of income is bound to chiefly fall.

Dealers' profits are in some cases merely marginal, and this has led to adulteration by separated milk, and possibly by other things too. This in many instances was inevitable with so large a fall in price, and therefore the consumers suffer in regard to the quality of the milk with which they are supplied.

There are grave doubts as to the wisdom of the policy which was initiated by the Aylesbury Dairy Company even so far as the consumers are concerned, and it has certainly been no blessing to the farmers who produce the milk. The present state of things cannot be expected to continue, for when milk is produced at a loss a change of some kind is near at hand.

CHAPTER XIII.

TECHNICAL EDUCATION IN DAIRY WORK.

Grants in Aid.—A Travelling Dairy.—The Counties of Stafford and Derby.—Mr. Valentine's Work.—Dairy Schools.—Prize Demonstration at Longnor.—Scale of Points.—Tuition in Cheese-making Needed.—An Open Mind.

LARGE sums of money, which the Government of the day had intended for buying up the good-will in trade of superfluous publicans, have been devoted to a different and a wiser purpose, viz. technical education in the industrial arts. In Ireland dairying had received grants in aid before; but in the rest of the British Islands tuition in the dairy had been left to "paddle its own canoe," as one may say—that is, to private and individual enterprise, and to the efforts of various agricultural societies.

The British Dairy Farmers' Association was formed, in 1876, for the express purpose of promoting dairy education, and much has been done by the Royal Agricultural Societies of England and Ireland, the Bath and West of England, and others. Generally, however, these tuitional efforts have been confined to essays, lectures, and demonstrations, all of them excellent in their way, and indispensable.

Some years ago, in Ireland, "a travelling dairy"—that is, a wheeled vehicle containing the necessary equipment for butter-making—was sent on a tour through some of the southern counties, stopping *en route* at various places, to give lectures and lessons to the people. The track of this van could be traced on the map, it was afterwards said, by the improved character of the butter that was made wherever it had been.

Here, then, was practical evidence of the value of tuition in dairy work ; this, however, was tuition only, and not technical instruction ; but if it could benefit the people so much, surely technical training would benefit them more.

When the public money referred to was allocated to the newly formed county councils, for purposes of technical education, there was some difficulty at first in deciding how to employ it. But in all dairying counties the manipulation of milk was regarded as an art of great importance,—an art to which improvement must be afforded, so far as was practicable, by means of technical education. My remarks in reference thereto will be confined to the counties of Stafford and Derby, which I best know. These two are largely engaged in dairy farming—in cheese and butter-making, in milk-selling, and in stock-breeding.

In the former county the work of tuition in butter-making has been assigned to Mr. Charles R. Valentine, of Ludlow, himself the author of a well-known book on the subject, and a practical dairy expert of tried merit. In the latter county, Miss Barron, of Borrowash, is the lecturer, demonstrator, and teacher, worthily following in the footsteps of her talented sister, whose death, so recently as April, 1892, was a distinct loss to progressive dairying in this country.

Mr. Valentine has had built a large van which, containing all the "plant" required for half a score pupils, is taken from one centre to another throughout the county. This van is not exactly a travelling dairy, for the work of the dairy is not done within it, but it is a convenient vehicle for transporting the plant used in a peripatetic dairy school. It is withal the embodiment of a useful idea, viz. to convey from place to place in the most convenient way possible, and with a minimum of loading and unloading, the many things required in the school.

The dairy school is usually accommodated in some room or other which is large enough, and commonly lent for the purpose. The school is "in term," at each place for about ten days, the first of which is devoted to a lecture and demonstra-

tion by Mr. Valentine himself, before the assembled pupils and whatever other audience there may be who are interested in the work. The lecture consists of a dissertation on the salient principles of modern butter-making ; and the demonstration of churning and making up of butter. On subsequent days the pupils themselves are the demonstrators, under the direction of the teacher.

On the last day it has sometimes occurred, on the first visit of the dairy school to a place, that the pupils compete for prizes which have been subscribed by persons who wish to encourage the work. It is perhaps worth placing on record that in February, 1892, at Longnor, a quiet little market town on the eastern fringe of the moorlands of Staffordshire, Mr. Valentine had a class of sixteen pupils, chiefly the daughters of dairy farmers in the neighbourhood. The prizes amounted to some forty volumes of books, for the most part standard works on dairy farming, or on other branches of agriculture.

This competition had the effect of awakening the interest and emulation of the district, and of firmly establishing the aims and objects of technical education in the dairy in the minds of the people. It is almost impossible that the sequel of all this should not be seen in a marked improvement of the butter produced in the valley of the Manifold and in the surrounding district.

The scale of points assigned to a competition in butter-making varies according to the judges' notions. In the one referred to they were as follows :—

	Points.
Preparation of cream, churn, &c.	5
Regulation of temperature	5
Efficient ventilation	5
Churning	10
Washing	10
Working	10
Making up	5
Grain of butter	5
General proficiency	10
	<hr/> 65

It is not pretended that this is the best scale of points that can be framed. It might, indeed, with advantage, perhaps, have been extended to 100, by giving 10 each to the first two, 5 each to colour, firmness, and dryness of the butter, and 10 to the cleaning of the utensils and general smartness in work. In this way the whole ground would be pretty thoroughly covered.

Technical education in dairy work has so far been almost entirely confined to the domain of butter-making. And we must admit that it accommodates itself much more readily than cheese-making does to the difficulties which appertain to a travelling school. Cheese-making, however, demands its share of attention, for in many dairying districts it is even more important than butter-making. So large a number of pupils can hardly be taken at the same time and place for technical instruction, nor can so many demonstrate what they have learnt as is readily the case in butter-making.

The "plant" in cheese-making is more ponderous than that in butter-making, as a general thing, unless where small cheeses are made, and several sets of it could not so conveniently be taken about from one centre to another. Where cheese factories exist they might be very conveniently used for the purposes of technical education, and extensively so for lectures and concurrent demonstrations. Cheddar cheese-making requires a somewhat more elaborate plant than other sorts do, and as this is the system pursued with more or less fidelity in most of the factories, it could be more conveniently taught in them than, for instance, Leicester, Stilton, or Gloucester methods could.

But there is always a good plant to be found at most of the larger farms where cheese is made at home, and we may safely assume that few farmers would fail to afford all the accommodation they conveniently could to technical education in cheese-making.

It is not at all desirable or probable that any of the various systems of cheese-making practised in this country should disappear before the ubiquitous Cheddar, although I am free to admit that the Cheddar, all things considered, is the best of

all. In the same way it might be maintained that the Short-horn breed of cattle is, all points considered, the best breed in England or in the world, but that is no sufficient reason why all the others should vanish before the cosmopolitan Short-horn.

It is better that we should preserve all our breeds of cattle and all our methods of cheese-making, unless, indeed, they persist in dying out, or some of the others assert the law of "the survival of the fittest" to their own advantage.

In order to preserve our different methods of cheese-making, it is necessary that the best that is known in each of them should be taught to all whom it may concern; and as funds for technical education are provided out of the public purse, the opportunity should be used as widely as possible; that is, in some farmhouse or other in almost every parish.

Scientific persons, so-called, are not a *sine quâ non* in all places, but any person who has reached the highest point in any given method of cheese-making may well be appointed a teacher; such a person, indeed, is "scientific" so far as that particular method is concerned. What we want, and what we may have if we try for it, is the best in everything made accessible to everybody.

One of the chief difficulties in the way of technical education in the dairy is the conceit of many people that at all events *they* have nothing to learn. If only everybody would approach the question with an open mind, a mind free from prejudice, a mind endued with the "never too late to learn" principle, technical education would make rapid progress through the shires, and a marked improvement in cheese and butter would quickly be seen.

CHAPTER XIV.

COMMON ILLS OF CATTLE.

Gurr.—Hoove.—Blackleg.—Ringworm.—Milk Fever, or Drop of the Kidneys.—Garget, or Mammitis.—Mawbound.—Hoven.—Foul and Thorough-pin.—“Foot-and-Mouth.”—Pleuro.—Sore Teats.

Gurr.—The malady known as “scour,” or “gurr,” is the earliest ailment that cattle are heir to, and as it occurs when calves are a day or two or a week or two old, it is commonly a weakening scourge, and not uncommonly fatal. It usually arises from indigestion, which is caused by improper feeding, or by a chill in a damp or draughty calf-house, or nausea or inertia induced by foul air, or by constitutional debility.

Carelessness and ignorance on the part of man, chiefly the former perhaps, are at the foundation of most of the mischief so common amongst young calves—carelessness about the draining, the dryness, the ventilation, the temperature of calf-sheds, most of all about the feeding of the calves, and so on. When calves run at large with their dams, they seldom suffer from indigestion; and why? Simply because the cows instinctively decline to let them suck too much at one time, and because as they suck the milk instead of drinking it, it gets well mixed with the saliva of the mouth, and cannot be gulped down the throat too rapidly.

Better feed a young calf four or five times a day, with less than a pint of milk at a time, until it is several days old, and never to give it all it would like to drink. Feeding-pails, with artificial teats, which cause the calf to suck in its food as if from the teat of its mother, are useful preventives of scour, along

with sparing quantity of milk for a week or two. A dose of castor oil containing thirty to forty drops of laudanum, repeated



FIG. 39.—FEEDING PAIL.

in six hours' time if the pain and flatulency do not abate; two or three doses, at intervals of six or eight hours, of Aromatic Balsam Oil, in each of which a well-beaten egg has been mixed, each dose of oil consisting of one or two wineglassfuls, according to the age and size of the calf; or, simpler still, a few doses of Day's Black Drink, or of their new, special preparation, Rozzinol, will put the mischief right.

Hoove.—The presence of parasitic worms—*bronchial filaria*—in the windpipe and in some or other of the bronchial tubes causes harassing irritation, sneezing, and coughing. They usually infest the weaker calves in the autumn of the year, causing diarrhoea and loss of flesh and of appetite. The attack may usually be prevented by housing the calves o' nights in a shed or yard, and not turning them out until the dew is off the grass. I have cured it by pouring a teaspoonful of a mixture of spirit of turpentine and olive oil down the upturned nostrils of each calf. This, however, is rough on the calf, and now I would use Day & Sons' "Huskolein," which is not only quicker but milder in action.

I may say here, speaking from an experience long enough to give value to the opinion, that every dairy and live-stock farmer will be wise if he have by him always a stock of Day & Sons' Red and Black Drinks, Oils, and other preparations which, in a case of emergency, may be literally worth their weight in silver and perhaps even in gold. Of this I am finally convinced, viz., that no farmer of method and foresight, who has proved the usefulness of these medicines, will ever permit himself to run out of them before he sends for more. He simply cannot afford to be without them, and *will not be without them* once he

knows how useful they are. No doubt the medicines prepared by other firms are good ; I only speak of those I know.

Blackleg.—This fatal but not infectious malady, otherwise called "speed," or "hyant," or "quarter-ill," belongs particularly to certain soils, chiefly those which are "unsound ;" but no soil, perhaps, can be declared absolutely proof against it. It usually attacks calves in their first autumn, frequently the best of them, but yearlings and "twinters" are not always exempt from it. If you see a calf alone—away from its mates—under a hedge or a wall, you may suspect something to be wrong ; if when you approach it moves not away, but hangs down its head and looks sleepy, and the skin when rubbed rustles like a silk dress, you may be certain that something is wrong, and that this "something" is blackleg.

The next best thing is to kill the calf out of its—not pain, perhaps, but—dull and hopeless misery, for it is certain to die in a few hours' time. At all events, I have never known one to recover. If anything can save it, however, it is Day's Red Drink in gruel and treacle, the calf, if a strong one, having been previously bled.

The malady is owing to deleterious matter in the blood, and can only be prevented by careful treatment and feeding. Calves should be kept thriving uniformly but not rapidly, and not on great and sudden changes of food. In order to in some measure preserve continuity in kind of food, as between autumn and winter, it is good practice to accustom calves to linseed cake from the time when first they are able to eat it—just a little of it through the autumn and winter, say half a pound to one pound per day, and occasionally a little salt mixed with it. Young calves are not liable to blackleg ; the most dangerous time is when they are five or six up to twelve months old. The last three months of the year seem to be the most dangerous, and November the worst of all. In some years the calves die numerously in that month, but the years vary very much.

My experience is that they are less liable to it if they run loose all winter on sheltered land, or with a shed to run under

in bad weather, than when they are tied by the neck all the time ; they are, in fact, healthier and better in all respects with liberty and good food than with good food without it.

Ringworm.—This is a parasitic disease common in young cattle in neglected districts, and it is contagious. Luckily, however, it is easily cured, if not very bad, by rubbing the patches where it occurs with oxide of zinc ointment. Two or three years ago I had a heifer—one of a lot I had bought—worse infected than any other I remember to have seen, though it had scarcely appeared at all when I bought her. Unsightly patches, rough and coarse, and as big as plates, broke out on various parts of her skin, chiefly in the folds of the neck.

It was hopeless to cope with it by the oxide of zinc treatment, but Messrs. Day & Sons supplied me with a bottle of white liquid which effected a complete cure with two or three dressings. The liquid is called Zynolix.

Milk Fever, or Drop of the Kidneys.—Deep milking cows, in good condition, are liable to this malady, particularly in hot weather, when they come to calve. Aged cows appear to be more liable to it than young ones. The symptoms are loss of appetite and restlessness, followed by dullness, prostration, and insensibility to such pain as is usually caused by the pricking of a pin. Lastly, paralysis ensues, followed ere long by death.

In the spring of 1892 I had a cow down with this most serious malady, already a good deal advanced in it when I returned from a journey. I at once gave her one of Day's Red Drinks in gruel, sweetened with treacle. In three hours I gave half a pint of whisky, and again one of Day's drinks. The whisky, which was to sustain the strength artificially whilst the medicine attacked the malady, was given alternately with the drinks for twenty-four hours, and afterwards alone with the object named. The cow was in a state of coma, completely helpless, and her lacteal functions were wholly inert. The udder was greatly distended with milk, but scarcely any of it at all could be drawn.

After thirty to forty hours' suspension of the lacteal functions,

however, our efforts met with success—the milk came freely, and the cow was saved! The remaining treatment consisted in rubbing mustard paste along the spine to establish a counter irritation, keeping the cow well clothed for warmth, turning her from side to side occasionally, and bolstering her up with straw. Presently her appetite returned, and she was fed with easily digestible food—bran mashes, and so on, and in a week or two was quite herself again.

A veterinary practitioner saw her at the end of the first day, and pronounced the case a hopeless one. I too had but little hope, but concluded I would persevere with the treatment.

To prevent milk fever, a cow in good condition should be sparingly fed for a week or two prior to parturition on food which is not very stimulative, and her bowels should be opened and her blood cooled by two or three quarter-pound doses of Epsom salts. If mischief be suspected, her milk should be drawn before she calves; and if it flows reluctantly, a red drink in treacle should be administered without delay.

Garget, or Mammitis.—This malady, so often fatal in cows whose condition is high, comes from various causes. Cows in milk are liable to it from careless milking, blows, from exposure to a cold draught in hot weather, and so on. Grazing cattle are sometimes seized with it in the heat of summer, and with them its course, if not checked, is commonly rapid.

In the case of a cow in milk, the contents of the udder must be removed if possible, and in any case a red drink should be administered first of all. The udder should be fomented with hot water several times a day, and rubbed with Purified Driffield Oils to break down the clots of coagulated milk. An udder remaining persistently hard should be rubbed twice a day with a mixture of equal parts of soap liniment, tincture of opium, and compound solution of iodine. If the teats are choked with clotted milk a syphon should be inserted, and a dose of four ounces of Epsom salts and one ounce of nitre may be given to diminish the secretion of milk.

Milch cows commonly lose "quarters" if carelessly treated under an attack of garget, and sometimes their lives; but they

may be saved, and the udder restored to normal action, by careful and persevering attention to directions.

Mawbound.—This is aggravated indigestion, and the cow becomes listless, loses her appetite, and ceases to ruminate; then the extremities become cold, the pulse feeble, and the breathing laborious, a grunt or groan following each expiration. Left alone, the cow will necessarily grow worse and die, but a red drink in gruel, with a pound of treacle, will, as a rule, set her right in a few hours' time; and if it does not, the dose should be repeated and the cow kept fairly warm.

Hoven.—Like mawbound, this is a distension of the rumen, but it is gas from dewy or frosted clover or grass, wet roots, raw grain—especially wheat—which causes this distension, whereas in mawbound it is caused by an accumulation of undigested food. Greedy feeding on these kinds of food induces abnormal fermentation, the gas evolved distends the rumen, the peristaltic action of the stomach ceases, digestion is checked, and the animal is in a state of distress. There is always a danger of rupture, and even of death, from pressure on the heart and lungs, if the case is neglected.

Ten drops of spirit of ammonia, in water, is said to be a capital remedy. But in any case one of Day's Black Drinks in water will almost certainly give relief, and the sooner it is given the better for the cow. If this should fail, an opening into the rumen from the outside should be made with a trocar, and the gas be allowed to escape. This is a surgical operation, and should be performed by a man who understands it.

Foul and Thorough-pin.—These are usually caused by grit in the clefts of the hoof, inducing irritation. There are two kinds of foul—smelling and swelling foul, the latter frequently developing into a thorough-pin. The former may be cured by cleaning out the cleft thoroughly, and applying a paste made of unsalted lard and blue vitriol in powder. The latter needs a good deal of poulticing to reduce the swelling, and an application of foot-rot oils, which will also cure smelling foul.

Swelling foul is accompanied with a good deal of pain and heat in the affected part, particularly when a thorough-pin is

forming. Persistent poulticing with linseed meal, and repeated dressings of foot-rot liquid, will expedite the formation of the abnormal growth, which in a few days' time will come out with a little assistance as a spongy core, and the foot heals quickly afterwards.

"Foot-and-Mouth."—This disease—contagious eczema—is only too well known and disastrous. Its technical name arises from the soreness which afflicts the mouth and the feet, along with discharge from the sores. From the mouth, indeed, there is a discharge of frothy saliva. It is not generally or even commonly a fatal disease, save perhaps in some instances when the weather is hot; but it causes serious loss of flesh and debility, and greatly interferes with the milk of dairy cows. The sequel of it in these cases is commonly deranged udders, shedded hoofs, and general emaciation.

Cooling and aperient medicines and nourishing gruels are beneficent, and the mouth and feet should be washed several times a day with dilute "Condy's Fluid," or some other mild astringent and antiseptic lotion. Cattle afflicted with this disease find comfort in standing up to the fetlocks in a stream of water, but they should not be allowed to do this for fear of infecting other cattle downstream. In any case their feet should be washed repeatedly, and shelter from a hot sun should always be afforded.

Pleuro.—Pleuro-pneumonia is generally fatal, and is also a most contagious disease. Sometimes it sweeps with alarming rapidity over a district, and at other times its progress is slow and fitful. Sometimes it will remain inert for months in a cow's system, and it is not easy to disinfect premises in which it has appeared. Probably half of the animals attacked would die, even under skilful professional treatment, and the lungs of those which recover are and remain structurally imperfect if the disease has once taken deep root in them.

A friend of mine, an extensive grazier in county Tipperary, affirms that he has cured scores and even hundreds of cases of pleuro. He will not undertake an advanced case. His method is effective only in the initial stages. He has failed to effect a

cure in no case that was taken in time. Pleuro was common in County Tipperary when he went there to farm. His landlord had given up farming in disgust because of its ravages. For a time at first his herd was free from it, but one day a heifer was visibly attacked.

This animal was separated from the rest only after a vast deal of chasing and violent perspiration—enough in itself to seal her doom, as my friend supposed—and she was at last taken into a wood, tied to a tree, and left to her fate. Late in the evening my friend went along that way, just to take, as it were, a bird's-eye view of her, quite expecting to find her dead. His astonishment, therefore, was something quite out of the common to see her standing there apparently all right, all the grass in a circle of the rope's length round the tree being eaten up bare enough. The heifer was then removed to a loose-box, dosed with medicine, fed judiciously, and in a day or two was as if nothing had been the matter with her.

This gave the clue to the cure, which, I have every reason to believe, has been applied in many cases since, for even my friend's neighbours used to bring their cows to him to be cured until the disease disappeared from the district. I am, I regret to say, unable to describe the cure in detail, but have confidence in the *bona-fide* nature of my friend's assurances.

Sore Teats are chiefly caused by milkers' long finger-nails. Naturally they do not improve a cow's temper, and sometimes she gives vent to her feelings by upsetting a pail of milk, and occasionally the milker with it. Then she gets thrashed, and her temper is permanently ruined.

If cows' teats were cleaned whenever they need it, before milking commenced, sore teats would seldom occur; they would hardly ever occur if milkers' finger-nails were kept short and even, and hands were always clean. A little unsalted lard worked well into the sores in the process of milking, will usually effect a cure, and at the same time make the process less painful to the cow.

CHAPTER XV.

PIGS.

Breeds of Pigs.—Bacon from Skim-milk and Oatmeal.—The Value of Whey.—Pig Breeding and Pig Feeding.—Pigs kept clean.—Luke-warm Food.—The best possible Breed of Pigs.—“What is worth doing at all is worth doing well.”

THERE are in this country several excellent breeds of pigs, upon which great attention has been bestowed during a long period. The neatest of these is the Berkshire breed, the largest the big white Yorkshire, and the least the small white Yorkshire. Besides these there is the Essex, the least compact of all ; the Tamworth, perhaps the most generally useful ; and the Shropshire, Dorset, and Devon breeds, though the last two are not so widely known as the others.

IN every part of the British Islands, indeed, excellent pigs are found, and many districts besides those named may almost claim to have separate breeds of their own. The medium-sized breeds are most in demand for general use, American bacon having reduced the demand for the larger and coarser English breeds.

ON dairy farms where cheese and butter are made, pigs are useful to consume whey and skim-milk. Whey cannot be put to any other use so profitably as to pig-feeding, but skim-milk is extremely useful for young stock—not cattle only, but horses too.

AT the same time, it must be admitted that bacon produced from skim-milk and oatmeal is about the best we can ever hope to get hold of. The pig, however, is the scavenger of the

farm, and eats up various things that would otherwise hardly be utilised at all.

The value of whey is variously estimated for pig-feeding purposes. Some farmers consider it is worth as many pounds sterling as they have cows in the herd. At the cheese factories one halfpenny per gallon is usually charged for it, which amounts to pretty much the same thing. We may take it, therefore, that the whey is considered to be worth about £50 per annum where fifty cows are kept for cheese-making. No doubt it realises this in some cases, but not in all—not, perhaps, in the majority of cases.

It is most of all useful where pig-breeding is a salient point on a dairy farm—that is, it is more useful for store pigs than for fattening ones. Fresh whey is better than sour whey for fattening purposes; for, if it goes sour, the sugar in it is changed, and so far is less valuable as a fattening agent. For this reason farmhouse whey is better than factory whey, as a rule, because it is fresher.

Pig-feeding as a rule is not a very profitable business. Pig-breeding is generally very much better. They both vary, however, and it sometimes occurs that breeding is not at all profitable, while feeding pays pretty well. Seldom is it that both of them pay at the same time equally well.

If farmers would study the agricultural returns each year as they are issued, they would be able to draw a pretty safe inference as to whether pig-breeding would pay or not in the following year. When young pigs at weaning-time are worth a guinea a-piece, they are considered to pay tolerably, but when they are over plentiful, and worth ten shillings instead, pay is out of the question. These remarks refer to the ordinary commercial pigs of the country, and not to the pedigree herds.

Pigs are fond of wallowing in the mire, of course; they are likewise fond of roaming at large, in obedience to their own sweet will. These are propensities inherited from their ancestors, who were, like ours, in a feral condition some thousands of years ago, but they are not at all desirable in a domesticated state.

Pigs thrive best when they are kept clean, and washing them two or three times a week in lukewarm water, and scrubbing them with a brush, have been found to answer well and to give satisfaction even to the pigs. They prefer a clean place to lie upon, and will generally keep one corner of the sty clean, for a bed, when all the rest is dirty.

They should always have boards to lie upon, in which event they will do very well without any straw at all, save in very cold weather. Pig-styes should be weather-proof, dry, fairly warm, and well ventilated. The paving flags should be laid in cement, for the sake of dryness and cleanness.

Breeding-styes should have a stout round rail running round them, a foot from the wall and the same from the floor; it is wanted to prevent the sow from crushing the young pigs, when she lies down, between her back and the wall. Whilst they are only a few weeks old, young pigs need some good dry straw to huddle together in; later on they will do just as well without it, save in cold weather. It is desirable that pigs should have warmth in cold weather; they will thrive all the faster for it.

All kinds of pigs, whether store or fat, will thrive better on lukewarm food, especially in winter. The temperature of the food may be about 70° Fahr. with advantage—higher in winter and lower in summer. Experiments have demonstrated that warm food pays, and, indeed, it is reasonable that it should. When an animal takes a mass of cold food into its stomach, the temperature of that food must be raised to the temperature of the body first of all; and herein is a loss of carbon, for a portion of it is wasted in raising the temperature of cold food to the point at which it is most readily digested.

The best possible breed of pigs is perhaps the Berkshire, but it does not follow that it will always pay the best in the hands of the rank and file of farmers. The Americans swear by the Poland China breed, and it is a good breed, no doubt, but it is not superior to our Tamworth or Shropshire, or to any of our medium-sized breeds, if, indeed, it is equal to any of them.

Whatever sort a man may take up for breeding purposes, it is sound policy to breed only from really good ones of that kind. If pig-breeding is to be made to pay at all, it can best be made to pay by using only animals that are well-bred themselves and of good quality and constitution. Of pig-breeding, as of almost everything, we may say : "A thing that is worth doing at all is worth doing well."

Mr. Sanders Spencer, of St. Ives, Huntingdon, has a large and very superior herd of the big Yorkshire breed, and has done more, perhaps, than any one else to improve it. His pigs are models of porcine symmetry and obesity, and are in considerable demand for export to various countries. Holywell Manor, in fact, is famous as the home of the best class of large White Yorkshires extant, and has become the "Dishley" or "Warlabby" of the breed. Pig-breeding is hardly so aristocratic a pursuit as Shorthorn or Shire Horse breeding, but it is eminently useful in its way, and really valuable in a country which annually raises from three to four millions of these domesticated quadrupeds. With judgment, management, and the required dash of genius, there is money in high-class pedigree pig-breeding, but only the right men can make it.

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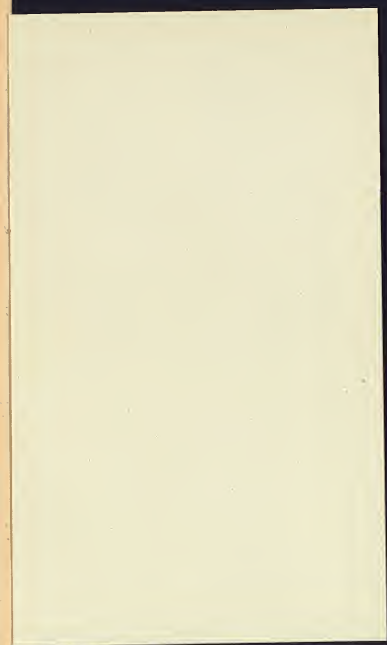
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